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Final Report

DEVELOPMENT OF AIR FORCE FLIGHT SAFETY MODELS

Volume 8

0-2

AIRCRAFT

January 1976

Prepared for

SERVICE ENGINEERING DIVISION
SAN ANTONIO AIR LOGISTICS CENTER
Kelly Air Force Base, Texas

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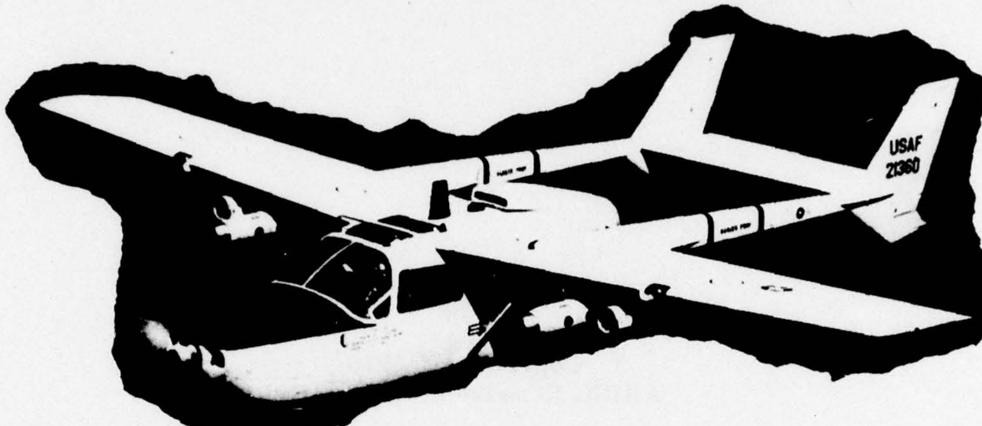

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ARINC RESEARCH CORPORATION

HEADQUARTERS
2551 Riva Road
Annapolis, Maryland 21401

SANTA ANA BRANCH
1222 E. Normandy Place
Santa Ana, California 92702

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ABSTRACT

A general description of the Flight Safety Prediction Technique, and the documentation associated with its specific application to the O-2A and O-2B aircraft, are presented.

GLOSSARY

This glossary presents general definitions of terms used in this report. The reader will find certain of these terms defined in somewhat different words in the text, depending on the context of the discussion; but the meaning will be consistent with the definitions given here.

Criticality	–	A numerical index of the significance of equipment failure history relative to aircraft safety. As an analysis parameter, it can be considered proportional to the likelihood that an item will fail and thereby cause an accident. It is the product of the failure probability and the sensitivity of an equipment item.
Dependency	–	See link dependency.
FSPT	–	Flight Safety Prediction Technique
Flight Phases	–	Discrete segments of the aircraft mission profile. For present purposes, the flight phases are defined as 1) startup and taxi, 2) takeoff, 3) climb, 4) cruise, 5) tactics, 6) cruise, 7) descend, 8) land, and 9) taxi and shutdown.
Functional Analysis	–	The determination of equipment relationships to aircraft functions performed, and the interrelationships of these functions.
Functional Link	–	The simplest form of functional relationship in which one function is dependent upon the next lower function.
Functional Path	–	The compilation of functional links, in sequence, through which a function is identified as being dependent upon another.
Link Dependency	–	The conditional probability of a dependent function failing, given that a particular function it is dependent upon has failed.
Provisory Condition	–	Operation of an aircraft in a mode or environment such that the safety-related importance of certain equipments is increased. Provisory conditions include icing, night flight, supersonic flight, etc.
Provisory Factor	–	The probability that a provisory condition exists. Also used to describe the coded notation used to indicate that a functional relationship is dependent on a particular provisory condition.
Safety Sensitivity	–	Same as "sensitivity".

Sensitivity – A quantitative indication of the degree of safety degradation to be expected if a function or piece of equipment fails. The more specific terms are "functional sensitivity" or "equipment item sensitivity".

Sensitivity Path – A particular sequence of functional dependencies (beginning at the top level in the hierarchical structure) through which a function or piece of equipment derives a sensitivity value. Equipment and functional sensitivity values are often derived through several such sensitivity paths.

FOREWORD

This document is part of a 16-volume report describing the application to specific aircraft types of ARINC Research Corporation's Flight Safety Prediction Technique (FSPT). The technique was developed under previous Air Force contracts (see Appendix A). The present effort, undertaken in 1972 under Contract F09603-72-A-1132-SA01, has led to further refinement of the FSPT through its broad application to many different types of aircraft. The flight safety models generated for these aircraft are presented in individual volumes of this report as follows:

Volume	Aircraft	Volume	Aircraft
2	T-38	10	B-52G, H
3	F-111A, FB-111A	11	C-130E
4	A-7D	12	KC-135
5	F-4D, E; and RF-4C	13	C-5A
6	C-141	14	T-39
7	A-37	15	F-15
8	O-2	16	UH-1N Helicopter
9	OV-10		

Volume 16 will document the results of a feasibility study of extending the FSPT to rotary-wing aircraft.

Volume 1, an overall summary of the contractual effort, will be issued at the end of the contract period.

CONTENTS

ILLUSTRATIONS AND TABLES

1
INTRODUCTION

The Flight Safety Prediction Technique developed by ARINC Research Corporation provides for assessment of the impact on flight safety of the failure of specific items of equipment within an aircraft. In the FSPT, mathematical modeling procedures are applied for processing aircraft-equipment failure data to yield a quantified index ranking safety-related problems on the basis of their likelihood of occurrence and the resulting degradation in the aircraft's capability to fly.

The ranking factor is called "criticality", which in its simplest form is the product of the failure probability and flight-safety sensitivity of an equipment. (A more detailed definition appears in Section 2 and Appendix B.) The failure probability inputs are from basic failure-data sources, AFM 66-1 and 65-110. The sensitivity estimates are derived by the following process:

a. Systematic analysis of aircraft functions to determine those essential to flight safety

b. Identification of the hardware required to perform these functions

c. Evaluation of the safety significance of the hardware in performing these essential aircraft functions.

The criticality values resulting from this approach provide a relative ranking of all malfunctions with respect to their safety significance. Figure 1-1 is a simplified example of how three equipment items would be ranked on the combined basis of their failure probability and safety sensitivity. This figure illustrates an example in which item A has the highest failure probability, but due to the low sensitivity value is ranked below item B in criticality.

The methodology has the ability to rank malfunction problems currently and continuously by their accident potential. This ranking, based on criticality assessment, can provide the basic parameters necessary for:

a. Identifying equipment items whose failure history and application pose a threat to aircraft safety

b. Quantifying the degree of threat associated with each equipment item

c. Evaluating and tracking the effectiveness of modifications to the aircraft

d. Assessing safety benefits versus the cost of proposed aircraft modifications, changes in maintenance or flight operations, or alternative aircraft designs.

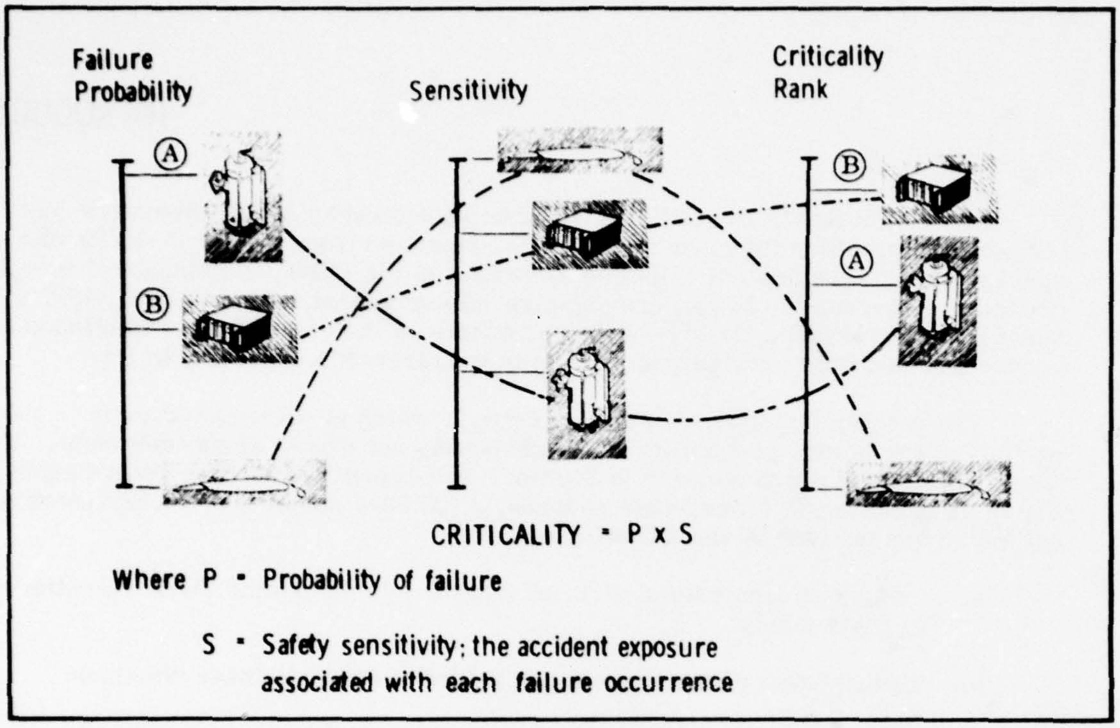


Figure 1-1. Example of Criticality Ranking Process

In this report, Section 4 and Appendix D pertain specifically to the O-2 aircraft. The remainder of the document provides support information that will make the O-2 data, and the method by which the data were obtained, more meaningful to the general reader.

Section 2 presents an overview of the development and utilization of the Flight Safety Prediction Technique; Section 3 discusses the steps associated with generating a safety model for calculating the safety criticality of various equipments of an aircraft; and Section 4 describes how the safety model for the O-2 aircraft was developed. Appendix A summarizes the contractual history of the development of the FSPT; Appendix B discusses mathematical considerations underlying the technique; Appendix C discusses FSPT documentation methods; and Appendix D presents functional relationship diagrams and a listing of keypunch cards that comprise the safety model documentation for the O-2 aircraft.

2
METHODOLOGY UNDERLYING FSPT

This section discusses the basic definitions and mathematical concepts associated with the Flight Safety Prediction Technique.

2.1 DEFINITION OF SAFE AIRCRAFT

To develop a relative measure of aircraft safety degradation resulting from specific equipment malfunctions, it is first necessary to define a "safe" aircraft. For purposes of the FSPT assessments, an aircraft is assumed to be in a safe condition if it is operating within its prescribed performance limits. Conversely, an aircraft operating (or about to operate) outside these limits is considered to be unsafe – in a condition where property damage and personal injury may result.

The safety prediction methodology does not attempt to assess the extent of possible personal injury or aircraft damage resulting from an unsafe condition. Neither does the concept consider ejection capability, parachutes, life rafts, etc., which do not make an aircraft safer per se but provide for the survivability of the aircrew when the aircraft is unsafe. Collision is also excluded from consideration because of the complexity of the interrelationships between pilot, aircraft equipment, ground surveillance, and traffic density.

2.2 MATHEMATICAL BASIS OF FSPT

The probability of an accident caused by the failure of an element can be expressed as the probability of the element failing multiplied by the conditional probability that the failure of the element will cause an accident. Stated in equation form:

$$P(\mathcal{A}, j) = P(j)P(\mathcal{A}|j) \tag{1}$$

where

$P(\mathcal{A}, j)$ = Probability of an accident due to failure of just the j^{th} element*

$P(j)$ = Probability that element j fails

$P(\mathcal{A}|j)$ = Probability of an accident given that the j^{th} element fails.

This equation reflects the basic relationships addressed in the FSPT where:

a. The criticality of the j^{th} element is an estimate of $P(\mathcal{A}, j)$

b. The sensitivity of the j^{th} element is an estimate of $P(\mathcal{A}|j)$

*In this and subsequent discussions, unless otherwise stated, expressions such as "failure of the j^{th} element" should be interpreted to mean: failure of only the j^{th} element, assuming all other elements are not failed.

Because an element's effect on safety may depend on the mission phase (see Section 3.2.1), the above model can be expanded to:

$$P(\mathcal{A},j) = \sum_{k=1}^{N} P_{j,k}\, P(\mathcal{A}|j,k) \qquad (2)$$

where

N = Number of mission phases

$P_{j,k}$ = Probability that the j^{th} element is failed in the k^{th} phase

$P(\mathcal{A}|j,k)$ = The j^{th} element's sensitivity in the k^{th} phase.

To identify the importance of discrete elements to aircraft safety, a flight profile consisting of nine distinct phases was defined. The phases are discussed in Section 3.2.1.

To utilize equation 2, it was necessary to develop a method for obtaining the values of $P(\mathcal{A}|j,k)$, the probability that a malfunction in element j during mission phase k will result in an accident. This method in turn requires the estimation of two parameters: the probability of accident if a major function is not available during each mission phase, and the dependence of the major function on subfunctions and elements during each such phase*. Each function and equipment item thus derives its sensitivity value from its relationship to the major function(s) dependent upon it.

2.3 SENSITIVITY ASSIGNMENTS

A great deal of information is available on the causes of aircraft accidents, but little exists from which to make the sensitivity assignments $[P(\mathcal{A}|j)]$. These assignments are therefore largely subjective, based on the analyst's knowledge of the system and any information he may have on previous accident history. The sensitivity assigments are reviewed (and revised as necessary) by an Air Force/contractor team working on a particular model to ensure that consistent criteria have been followed. The team review and negotiation of sensitivity assignments is the mechanism by which the value becomes sufficiently objective for use with the model. This negotiation considers all of those top level functions as a group and reassigns sensitivity values as necessary to assure that the most objective proportionality is attained for the particular aircraft model. The same major-function sensitivity values are used for major functions on all aircraft models where configuration and mission profiles permit.

The development of criticality rankings for the various elements (j's) is dependent upon the ability to quantify the failure probability $[P(j)]$ and the element sensitivity $[P(\mathcal{A}|j)]$ for each element. Since the intent of the concept is to provide a relative safety ranking of all malfunctions, it is not necessary to develop absolute

*For a more detailed discussion of the mathematics of the FSPT, see Appendix B.

values for $P(\mathcal{A}|j)$. If the sensitivity values developed are correct relative to each other, a proper criticality ranking will be established. It is intended that criticality be an index proportional to $P(\mathcal{A}, j)$ and therefore provide the same relative rank ordering of elements. The major reasons for proportionality, rather than equality, are:

a. The FSPT does not account for the effect of extraordinary pilot intervention to prevent an accident in case of equipment malfunction.

b. Criticality quantification was limited in its treatment of simultaneous occurrence of independent, primary failures.

c. Operational and malfunction data yield only a proportional estimate of the required information.

While strict proportionality cannot be mathematically proven, it is believed that the criticality rankings provide reasonable relative measures of equipment problem potential.

3

MODEL DEVELOPMENT

Figure 3-1 summarizes the approach to the assessment of flight-safety criticality of aircraft equipment. The first contractor activity is the identification of all functions the aircraft is expected to perform and the determination of their inter-relationships. Next, each functional relationship is documented; and then sensitivity assignments are made at the major functional levels (below these levels, link dependency values are estimated; see discussion, Section 3.2.2). This process is carried out until each work unit code associated with a major function has been identified with respect to the function performed and dependencies have been estimated. Computer processing calculates the safety sensitivity for each work unit coded item, combines these values with the operation and failure data input by the Air Force, and produces the equipment criticality ranking.

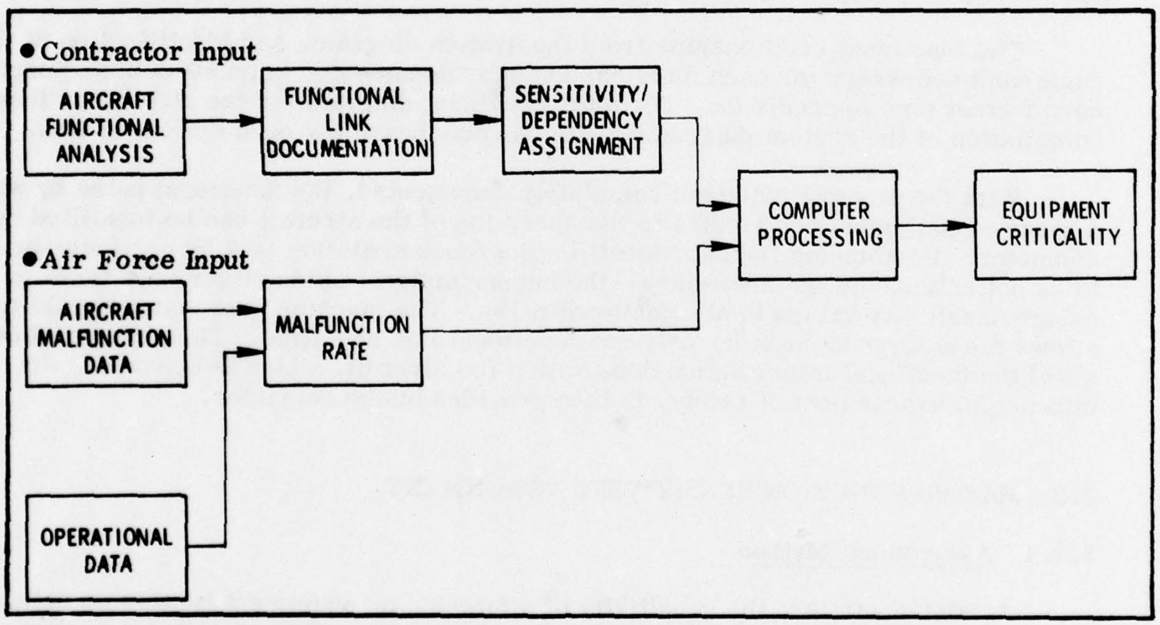


Figure 3-1. Activities and Data Inputs to Flight Safety Criticality Assessment

The steps in this process are discussed in greater detail in the following sections.

3.1 FUNCTIONAL ANALYSIS

Functional analysis entails the systematic identification of the relationships of hardware to the functions performed by the aircraft and documented in the aircraft technical orders. Tabulated for each aircraft function are the equipments necessary for its performance as well as all outputs required for other systems. The complexity of the functional interdependencies of an aircraft requires the use of a systematic

accounting procedure, as discussed below, to assure that all relationships have been identified and that no functional paths have been overlooked.

Certain top-level functions (comprised of both "primary" and "major" functions) have been defined as applicable to all aircraft types, and serve as the starting point for a safety analysis. Figure 3-2 lists these top level functions with the primary function of Flight Control expanded to show its typical major functions. Below the major function level, differences in aircraft types result in function identification and structuring specifically suited to each aircraft. In Figure 3-2, for instance, the major function Roll Control is subdivided into Left Roll and Right Roll, and further into aileron and spoiler actuation subfunctions. This structure is that applicable to an F-4 aircraft, in which ailerons have an extremely limited upward travel and lift is primarily lost through spoiler operation. Finally, each item in the aircraft WUC ("-06") manual is identified with respect to the function it performs. *

Every function and every WUC included in the model receives an "alpha designator" unique to that aircraft model. Due to the large number of alpha designators required in a model, an indenturing system is utilized to prevent duplication. However, the location in the hierarchical structure and the number of characters in the alpha designators are often independent, since such correlation is not necessary for subsequent computer processing.

The functional relationships from the system diagram, and identification of the equipment necessary for each function, are next documented in an 80-column punchcard format (see Appendix C). The total functional diagram for the aircraft is then a compilation of the system diagrams, with one punchcard for each functional link.

With the aircraft functions completely documented, the functional paths by which a piece of equipment contributes to the operation of the aircraft can be identified by computer. Performing the path-identification/documentation task by computer proves to be not only useful but necessary – the human analyst could neither keep track of nor assign sensitivity values to all functional paths. The machine processing capability allows the analyst to consider only one functional link at a time. The ability to follow all of the functional interrelationships within the aircraft, which is necessary for meaningful assessment of safety, is then provided by the computer.

3.2 MAJOR-FUNCTION SENSITIVITY ASSIGNMENT

3.2.1 Assignment Method

As stated earlier, the sensitivity of a function or equipment item is an estimate of the probability that its failure will cause an accident. From functional analysis of the aircraft under consideration, major functions are identified and are assigned sensitivity values for each phase of the mission.

*Certain WUC items in the "-06" manual may not be included in the safety model, these items being either 1) eliminated by TCTOs; 2) purely structural items in the 11000 series; 3) necessary only for survivability or ejection; 4) of lower indenture than the LRU level, where computer data screening eliminates failure reports.

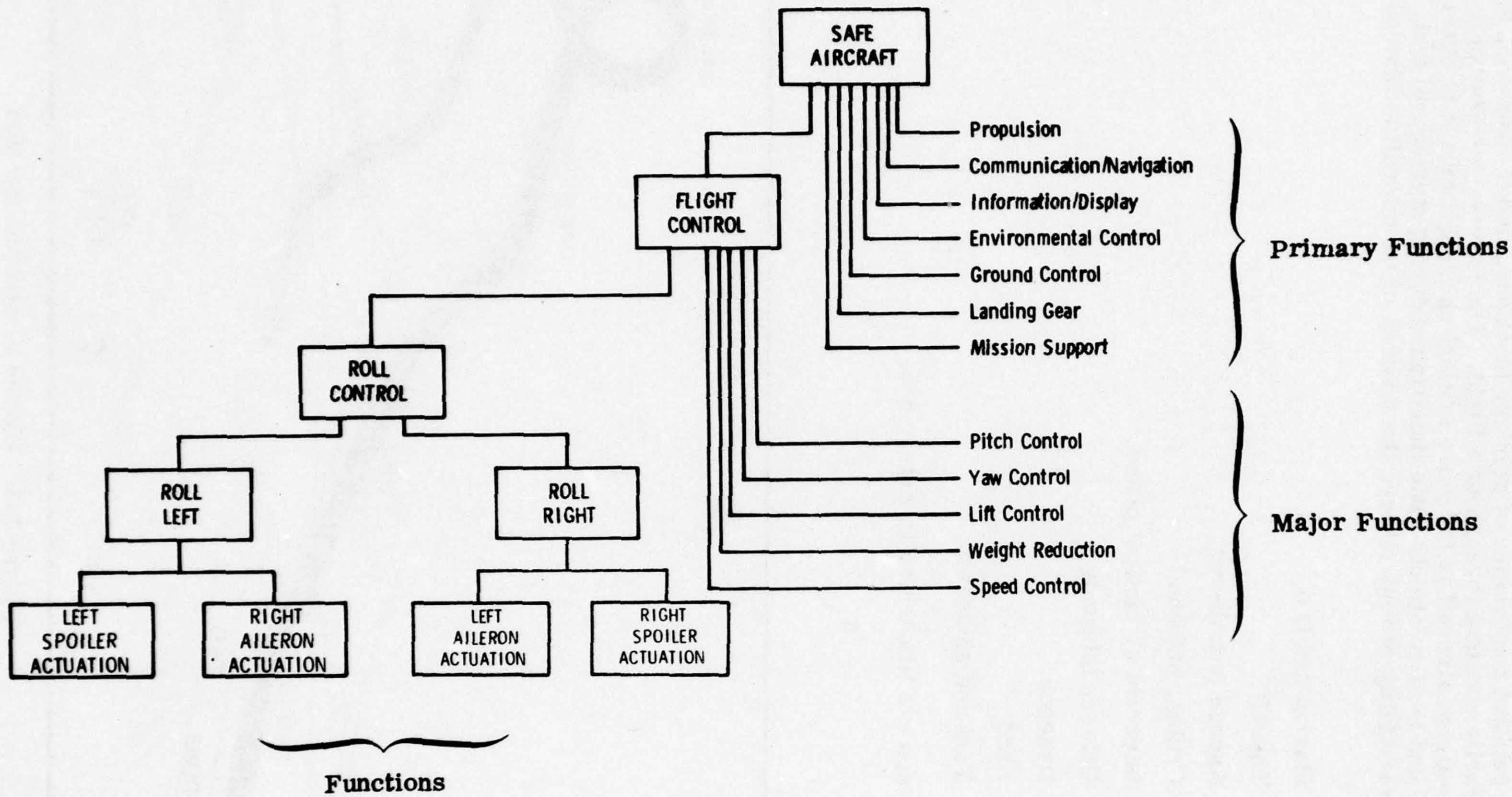


Figure 3-2. Hierarchical Structure of Aircraft Functions

The relative importance of primary functions, major functions, and functions is not necessarily constant throughout a flight. The failure, for example, of one engine of a multi-engine aircraft is far more critical on takeoff than it is during the rest of the flight, and is of relatively little importance during startup and taxi. To accommodate this variability of importance, the mission of an aircraft is divided into nine flight phases:

1. Startup and taxi
2. Takeoff
3. Ascend (climb-out)
4. Cruise, outbound
5. Intercept or tactical phase
6. Cruise, inbound
7. Descend
8. Land
9. Taxi and shutdown

These phases are illustrated in Figure 3-3.

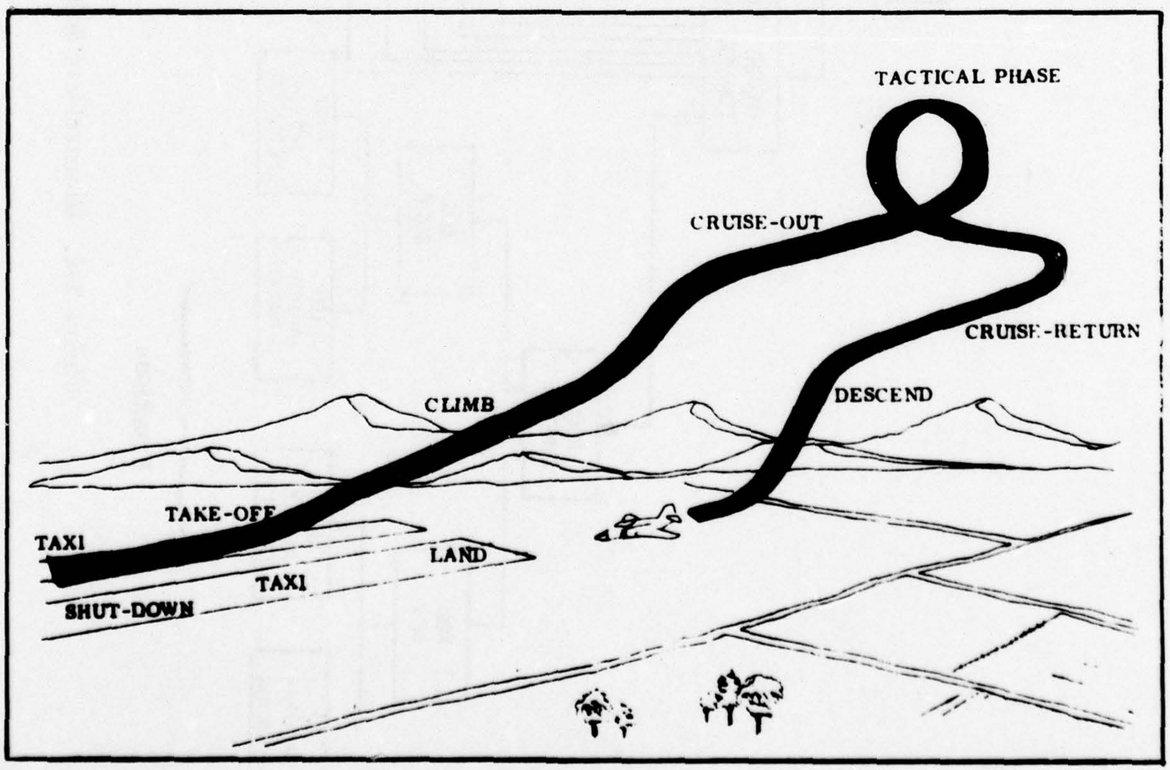


Figure 3-3. Phases of Aircraft Mission

A sensitivity value is assigned for each of the phases, and represents the best estimate of the likelihood that the aircraft will enter a hazardous mode if the function is not present in that phase. The numerical values assigned are proportional rather than absolute, and range from 0.0 to 1.0. The keypunch card format limits this assignment to increments of 0.1. Increments smaller than 0.1, when required, were assigned by defining a quasi-function for insertion between the major function and its dependent primary function.

3.2.2 Link Dependency Assignment

"Link dependency" is defined as the probability that the loss of a function will result in the loss of a dependent function. (For a more detailed discussion of this term, see Appendix B.) The assignment of link dependency values requires knowledge of the operation of specific aircraft because it is concerned only with functional levels below the "major" category. At this lower level, no evaluation is made of the impact on flight safety of the loss of functions. Instead, the effect of the loss of one function on the performance of another function becomes the evaluation criterion. Like sensitivities, link dependency values are assigned in increments of 0.1. Additionally, the method of attenuation used in assigning sensitivity values can also be applied to link dependencies.

3.2.3 Provisory Factors

The sensitivity of major functions with respect to aircraft safety, and at the lower levels the link dependency between functions, can be dependent on external influences and aircraft operating conditions. To accommodate these external influences, a set of provisory factors has been identified. An example would be a windshield anti-ice system, which has a safety sensitivity close to 1.0 during landing under icing conditions but a negligible effect on a dry, warm day.

Under such circumstances, the procedure is to assign the "worst case" value (assuming the condition exists). During model exercise the likelihood that the condition exists can be "read-in", thereby allowing the sensitivity value to be assigned by the computer based on the likelihood of the condition and the probability that the higher level function will therefore be lost. Table 3-1 lists the standard provisory factors used in FSPT models.

3.2.4 Computer Processing

Documentation of a flight safety analysis by ARINC Research thus consists of functional diagrams, coded functional tabulations, a functional data processing card deck, and a machine-prepared printout of the card deck data. Under this contract, the documentation is then sent to San Antonio Air Logistics Center for review by MMER personnel and representatives of the Air Logistics Center responsible for the particular aircraft (if other than SA/ALC).

SA/ALC processes the functional data card deck utilizing a number of computerized operations. First, a functional deck edit is accomplished to identify certain format or logic errors that may exist. Next, a path identification/documentation run is made that traces all possible paths associated with each function and calculates the numerical sensitivities by flight phase down to the WUC level. Then, a path combination run is made taking into account the dependence of more than one major function on a particular WUC. Finally, failure information from the 66-1 data system and numerical factors for provisory conditions are input and a WUC criticality list by rank order is generated by the computer.

TABLE 3-1. PROVISORY FACTOR CODES

Code	Provisory Condition
A	Icing conditions
B	Adverse speed/altitude operations
C	Runway stopping distance/confined area (Helicopter)
D	Night operation
E	IFR conditions
F	Supersonic flight
G	Rain
H	Solo flight
I	Loss of function for which indication is provided
K	Normal system failed
T	Flame-out
X	Fire
Y	Cold weather
2	One of three available units is required
3	Two of three available units are required
4	One of four available units is required
5	Two of four available units are required
6	Three of four available units are required
8	Four of eight available units are required

An additional product generated by the computer is a two-part criticality trend analysis. Part I contains the criticality rankings and linear regression analysis by WUC for the previous 12 months. Part II contains plots of the criticalities and regression lines for the 25 WUCs top-ranked according to safety criticality.

3.2.5 Model Maintenance

Each time an aircraft type for which a safety model has been developed undergoes a modification, the effects of the changes on the model must be evaluated. Technical order and WUC revisions must be incorporated into the model. Removal of existing hardware, the installation of new hardware, or design improvements may change link dependencies and sensitivity assignments. The update procedure should follow the same general steps as outlined for the initial analysis effort.

Existing block diagrams and a printout of the functional card deck form the baseline for change identification. Functional relationships should be reviewed to determine the impact of changes on the documented safety analysis. Diagrams should be revised to reflect functional differences, WUC changes should be noted, and all differences listed on a flight-safety functional tabulation sheet. The functional deck printout can be used for manual indication of what the changes are and where they occur. New data cards are prepared and the functional deck updated by the removal of obsolete cards and the insertion of new cards. From this point on, the computer is again utilized to edit the functional deck, perform path identification/documentation, and calculate sensitivities for each WUC.

Block diagrams and other affected portions of the specific aircraft safety analysis report should be updated and revised pages issued that reflect these changes. Maintaining an accurate and updated model is important to obtaining an accurate assessment of the safety significance of hardware failures.

4
O-2 MODEL DEVELOPMENT

The FSPT model documented herein applies to the O-2A and O-2B aircraft. Model development on these aircraft was initiated in August 1974, and the completed documentation was submitted to SA/ALC for computer edit in January 1975.

The aircraft flight manual and maintenance technical orders provided the information on aircraft system operation. The model developed represents the O-2 aircraft configured to the latest time compliance technical orders (TCTOs) documented in the manuals supplied by SA/ALC. Table 4-1 lists the manuals and their revision status applicable to the developed model.

The O-2 safety model was developed by ARINC Research for all systems except the landing gear. The landing gear diagram and functional documentation cards were produced by MMER/SA/ALC, and interface documentation for the landing gear was a joint effort by SA/ALC and ARINC Research.

A single functional documentation deck having "O2" in columns 1 and 2 was used for the two versions of the O-2 aircraft. Cards having a blank in column 3 are common to both the O-2A and O-2B aircraft. When the common cards are combined with those having an "A" in column 3, the resulting deck documents the O-2A. Similarly, the common cards combined with the cards containing a "B" in column 3 document the O-2B.

Because of the vulnerability of the functional logic/sensitivity documentation to such errors as omission of links, duplication of cards, and keypunching, quality reviews were conducted at various critical points in the model development. In addition to keypunch verification, each card was checked against the functional link shown on the original rough draft and the final functional diagram and the diagrammed link was checked off. Missing or duplicated functional links were thus identified. Work unit codes used in the model were checked off against the WUC manual to assure completeness.

The quality reviews were first conducted by the organizations responsible for the subsystems prior to merging and computer verification of the respective aircraft decks by SA/ALC. Following the merging of the Air Force/ARINC Research decks and computer verification at SA/ALC, a second quality review was performed by representatives of ARINC Research and SA/ALC. Finally, the first criticality printout obtained from application of actual aircraft data was reviewed to identify any items whose sensitivity appeared to be unreasonable. In such cases the paths were traced manually and changes made if an erroneous relationship was found.

Appendix C presents the methods and standards used in documenting an FSPT aircraft model. Appendix D presents the FSPT documentation for the O-2 aircraft, which covers both the SA/ALC and ARINC Research portion of the model.

TABLE 4-1. O-2 SYSTEM DOCUMENTATION

Publication No.	Title	Revision/Date
1L-2A-1	Flight Manual	Basic, 1 Mar 1973
1L-2A-2	Maintenance	Change 9, 1 May 1971
1L-2A-6	Work Unit Code Manual	Change 3, 1 May 1974

APPENDIX A

HISTORICAL SUMMARY OF FSPT

HISTORICAL SUMMARY OF FSPT

In 1965, the desirability and practicability of quantifying the significance of specific equipment malfunctions relative to flight safety was explored in a feasibility study conducted by ARINC Research Corporation for the Air Force. The feasibility of a safety-quantification approach, which has subsequently become known as Flight Safety Prediction Technique (FSPT), was demonstrated; and the method was developed and refined in a series of studies, as follows:

Study Phase	Subject/Date	Sponsor*/Publication No.
I	Feasibility Study, September 1965 to June 1967 (Phase I)	Sacramento Air Materiel Area (SMNE), Contract AF09(603)62335, SM-67-2; publication 705-01-1-777
II-A	Technique Development, October 1967 to July 1968 (Phase II-A)	San Antonio Air Materiel Area (SANEW), Contract AF09(603)-67-A-0267-SA01; publication 734-01-1-895
II-B	Technique Development, July 1968 to July 1969 (Phase II-B)	San Antonio Air Materiel Area (SANEW), Contract F09(603)-68-A-0317-SA01; publication 754-01-1-985 (Revision 1)
	FSPT System Documentation for the F-4C and T-37 Aircraft, October 1970 to June 1971	San Antonio Air Materiel Area (MMER) Contract F41608-71-C-0576; publication 697-01-1-1118

In the Phase II-B study, the FSPT was applied to the F-106 aircraft. Concurrent with Phase II-B, the U.S. Naval Safety Center contracted ARINC Research to extend the methodology to produce a flight safety criticality model for the F-4J aircraft. The results of this effort are documented in ARINC Research Publication 753-01-3-982 (Revision 1).

In 1970, ARINC Research was contracted to develop suitable input data to permit the application of the technique to the T-37 and F-4C aircraft. These data were derived in the form of mathematical model functional documentation as input to the basic computer program developed and applied to the F-106.

In 1972, ARINC Research Corporation was awarded a contract, with the subsequent modifications in 1973 and 1974, to apply the Flight Safety Prediction Technique to 15 aircraft, working jointly with cognizant Air Logistics Centers. Aircraft to which the FSPT has been applied under this latter contract (F09603-72-A-1132-SA01) include:

a. T-38

b. F-111A and FB-111A

*The office symbols of Service Engineering at the Sacramento and San Antonio Air Materiel Areas are now SM/ALC/MME and SA/ALC/MME, respectively.

c. A-7D

d. F-4D, E; RF-4C

e. C-141

f. A-37

g. O-2

h. OV-10

i. B-52G, H

j. C-130E

k. KC-135

l. C-5A

m. T-39

n. F-15

o. UH-1N Helicopter*

*Feasibility study of adaptation of FSPT to rotary-wing aircraft.

APPENDIX B

FORMULATION OF CRITICALITY-ASSESSMENT TECHNIQUE

FORMULATION OF CRITICALITY-ASSESSMENT TECHNIQUE

To implement the basic safety model defined in Section 2.2, it is necessary to develop a submodel for the probability that a malfunction in element j during mission phase k will result in an accident. This submodel in turn requires that we estimate two parameters: the probability of accident if a major function is not available during each mission phase, and the dependence of the major function on element j during each mission phase.

The first parameter is termed "functional sensitivity" and is estimated for each major function. The functional analysis performed in this task established for an aircraft the following hierarchal scheme:

Aircraft

Primary functions

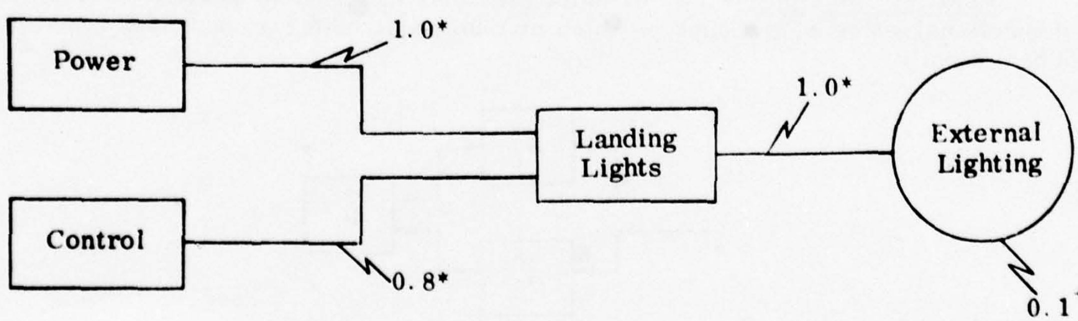
Major functions

Function

Elements (Work Unit Codes)

A primary function would be one such as Flight Control. Major functions under Flight Control would include Pitch Control and Yaw Control.

The second parameter, "link dependency," is a vehicle for showing the influence of each functional-path element on the performance of a major function. For example, if the major function being considered is External Lighting, the following diagram illustrates the nature of functional sensitivity and link dependency values.



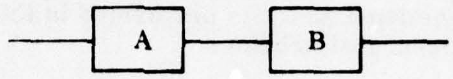
* Link dependencies
+Functional sensitivity

The 0.8 value means that failure of the Control function will result in loss of the Landing Light function 80% of the time. The 0.1 functional sensitivity value denotes that loss of external lighting will result in an accident 10% of the time. The values must be interpreted in a proportional sense, in that the actual accident probability is dependent upon external factors (see Section 3.2.3).

The remainder of this appendix discusses the procedures and model used to obtain element sensitivities; e.g., in the above example, the accident probability given that a Work Unit Code in the Control function malfunctions.

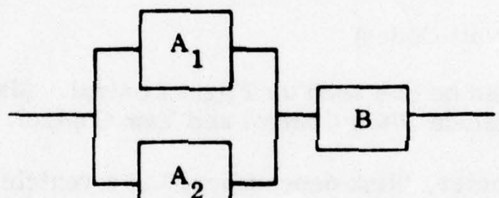
Three principal types of functional relationship--series, redundant, and parallel--were identified as representing the major forms to consider in modeling element sensitivity.

Series Relationship – A function having only one input. Schematically,



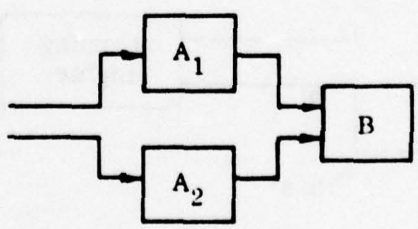
which indicates that outside of its own elements, the success of function B is only affected by the success of function A.

Functional Redundancy – A function having one or more backup functions that can provide the required inputs to successor functions. Schematically,



where A_1 and A_2 represent a functional redundancy in that either may provide the necessary input to B.

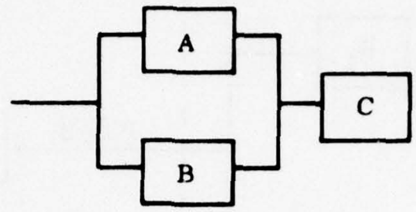
Parallel Functions – Two or more functions independent of each other in terms of functional success, but each of which may be required for a successor function. Schematically,



B will generally require both A_1 and A_2; but A_1 does not depend on A_2, nor does A_2 depend on A_1.

In some cases the distinction between functional redundancy and parallel paths is very slight, and may depend on mission phase. For example the four engines of a plane can be considered to be a redundant configuration providing inputs to the primary propulsion function during cruising, but would generally be considered to be parallel functions during takeoffs requiring full power.

In general, given a schematic relationship of the form,

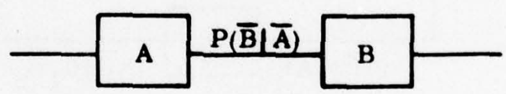


we can say that A and B are in a functionally redundant configuration if the success probability of C is the same if 1) A and B are successful, 2) A only is successful, or 3) B only is successful. If, for example, C is more likely to be successful if both A and B are successful, rather than A or B alone, then the relationship is one of parallel paths.

It is noted that the model will also account for element redundance and parallel elements through inputs such as $P(\overline{A}|i_a)$, representing the probability that the A^{th} function fails given that the i_a^{th} element in A has failed. If i_a is a parallel element, the probability would depend on mission requirements and other parallel-element states.

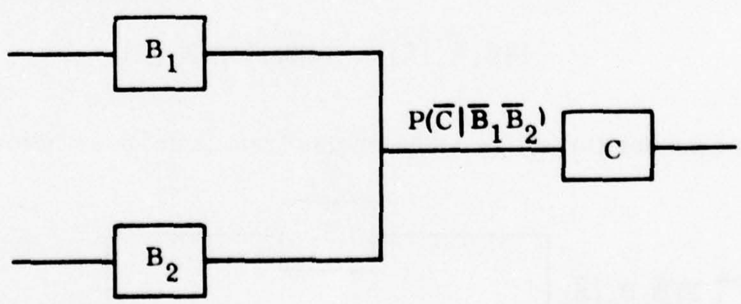
Link dependency is the conditional probability of a functional failure, given the failure of immediate predecessor functions. The link dependencies applicable to the three basic designs defined above are shown below.

<u>Series Relationship</u>

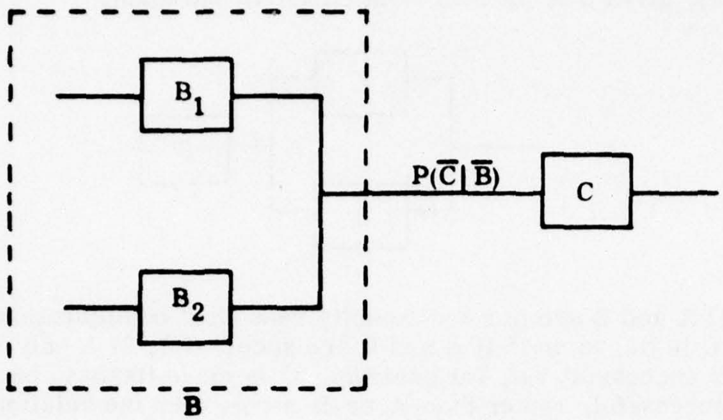


Link dependency = $P(\overline{B}|\overline{A})$ = probability that B fails given that A fails.

<u>Functional Redundancy</u>

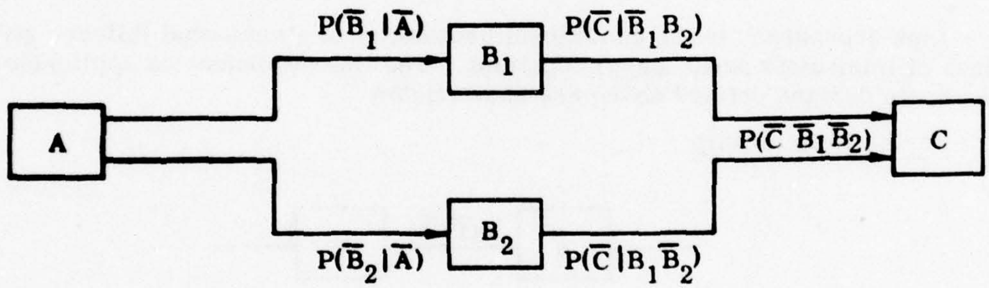


equivalent to



where $\overline{B} = \overline{B}_1\overline{B}_2$

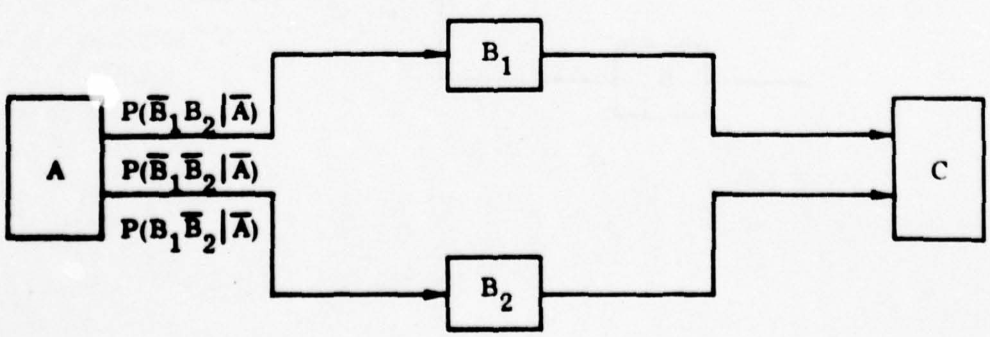
Parallel Functions



We shall generally assume that the dependencies of B_1 with respect to A, and of B_2 with respect to A, are independent of each other, so that

$$P(\overline{B}_1\overline{B}_2|\overline{A}) = P(\overline{B}_1|\overline{A})P(\overline{B}_2|\overline{A})$$

We then can consider three link dependencies from A to B as follows:



noting that

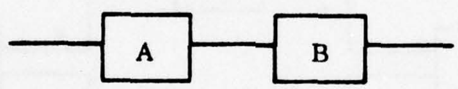
$$P(\overline{B}_1|\overline{A}) = P(\overline{B}_1 B_2|\overline{A}) + P(\overline{B}_1\overline{B}_2|\overline{A})$$

$$P(\overline{B}_2|\overline{A}) = P(B_1\overline{B}_2|\overline{A}) + P(\overline{B}_1\overline{B}_2|\overline{A})$$

Models are shown below for determining the sensitivity of elements within a function for each of the three basic designs. The following basic assumptions apply:

a. Except for cases where an element has a redundant or parallel counterpart or is located in a function with a redundant or parallel function, only the element under consideration shall be assumed to have failed initially. Thus the expression $P(\mathcal{A}|i_a)$, representing the accident probability given failure of the i^{th} Work Unit Code element, is based on the assumption that no other element has failed unless element i is in some redundant or parallel configuration. For cases in which there are redundant or parallel counterparts, failures of such counterpart elements or functions are considered in accordance with their occurrence probabilities.

b. The success of all immediate predecessors ensures the success of a function, provided that the function experiences no element failures. Thus for the series function relationship



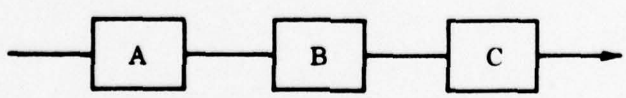
we assume

$$P(\overline{B}|A) = 0,$$

provided B experiences no element failures. If an element in function A is under consideration, the latter provision is always true by assumption "a."

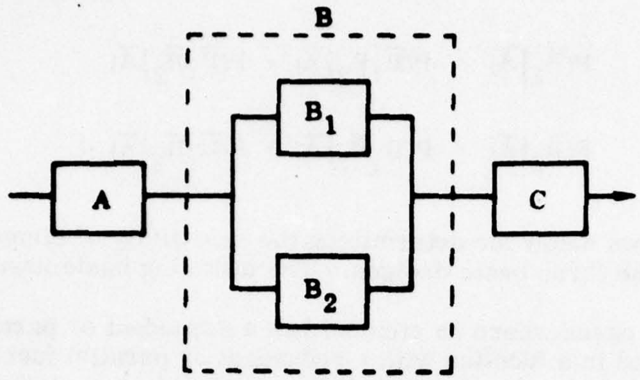
The element sensitivity models are:

<u>Series Relationship</u>



$$P(\mathcal{A}|i_a) = P(\overline{A}|i_a)P(\overline{B}|\overline{A})P(\overline{C}|\overline{B})P(\mathcal{A}|\overline{C})$$

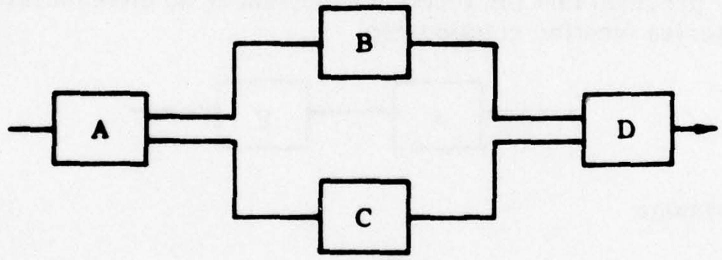
Functional Redundancy



$$P(\mathcal{A}|i_a) = P(\overline{A}|i_a)P(\overline{B}|\overline{A})P(\overline{C}|\overline{B})P(\mathcal{A}|\overline{C})$$

$$P(\mathcal{A}|i_{b1}) = P(\overline{B}_1|i_{b1})P(\overline{B}_2)P(\overline{C}|\overline{B})P(\mathcal{A}|\overline{C})$$

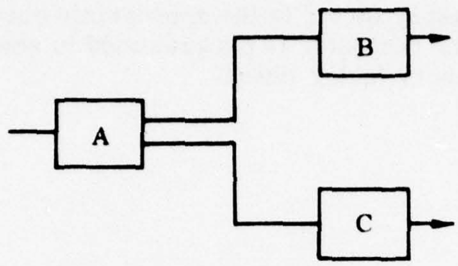
Parallel Functions



$$P(\mathcal{A}|i_a) = P(\overline{A}|i_a)\{P(\overline{B}C|\overline{A})P(\overline{D}|\overline{B}C) + P(B\overline{C}|\overline{A})P(\overline{D}|B\overline{C}) + P(\overline{BC}|\overline{A})P(\overline{D}|\overline{BC})\}P(\mathcal{A}|\overline{D})$$

$$P(\mathcal{A}|i_b) = P(\overline{B}|i_b)\{P(\overline{C}|i_b)P(\overline{D}|\overline{BC}) + P(C|i_b)P(\overline{D}|\overline{B}C)\}P(\mathcal{A}|\overline{D})$$

A case not explicitly incuded in the above three basic functional relationships is one for which a function is in two paths, e.g.,



then

$$P(\mathcal{A}|i_a) = P(\overline{C}|i_a)P(B|i_a)P(\mathcal{A}|\overline{C}B) + P(C|i_a)P(\overline{B}|i_a)P(\mathcal{A}|C\overline{B})$$

$$+ P(\overline{C}|i_a)P(\overline{B}|i_a)\{1 - P(\overline{\mathcal{A}}|\overline{C})P(\overline{\mathcal{A}}|\overline{B})\}$$

where it is assumed that the effects of loss of the major functions in accident occurrence are independent of each other.

Use of Numerical Provisory Factors for Partially Redundant Systems

The numerical provisory factors (see Table 3-1) are used where more than two identical functions are involved in a redundancy. For example, aircraft with more than two engines often have identical and independent systems for hydraulic pressurization, and for electrical power generation, one driven by each engine. If the aircraft can be operated safely with one or more of such systems in a failed state, one of the numeric codes is utilized in assigning link dependency values. Consider, for example, the following:

If N identical and independent units* are available and at least M are required for safe operation, where $0<M<N$, then the provisory factor of a given unit, say U_j, is the probability that the failure of U_j will cause the aircraft to enter an unsafe state. This is the probability that exactly M-1 of the remaining N-1 units will be in an unfailed state. This probability can be calculated by the formula for the binomial distribution, and is given by

$$P(U_j) = \binom{N-1}{M-1} p^{(M-1)} q^{(N-M)}$$

where $P(U_j)$ = probability that failure of the j^{th} unit will cause the aircraft to enter an unsafe state, and

M = Number of units required

N = Number of units available

p = Probability that a single unit will be in an unfailed state

q = Probability that a single unit will be in a failed state or (1-p)

*Units may be either elements, element assemblies, or functions.

Assignment of link dependencies to N identical and independent units of which only M are required proceeds as follows. The value assigned to each unit is the dependency of the higher level function on receiving an output from M of the units (usually 1.0). The provisory factor is the appropriate numeric code. In the evaluation of the path sensitivity, the computer is programmed to select the binomial formula that corresponds to the provisory factor listed.

APPENDIX C

FSPT DOCUMENTATION METHODS

FSPT DOCUMENTATION METHODS

Because of the extreme complexity of aircraft, it is necessary to develop a computerized method to identify and document all possible paths associated with each function as well as to determine the safety sensitivity associated with each path. A computer routine has been devised that takes the data from the functional card deck and traces and documents all paths. For each WUC, it also computes the flight-phase sensitivities for each path in which the WUC is present. The resulting computer printout provides a combined functional path sensitivity.

C.1 ALPHA CODING

As each system of the aircraft is functionally diagrammed, the functional blocks are assigned an "alpha code". This code aids the analyst in the bookkeeping tasks of functional diagramming and provides the computer with an identification of the elements to be processed. For standardization among aircraft, nine top-level functions have been defined and each has been assigned an initial or first-alpha designator. Each block in the functional diagram carries the same initial alpha as the top level function. Subsequent letters added to the initial alpha uniquely identify each block.

The only restrictions placed on the assignment of alpha codes are that:

a. All characters in a code must be a letter of the alphabet, and

b. The maximum number of characters in one code is seven.

C.2 ALPHA CODING AND COMPUTER PROGRAM COMPATIBILITY

Additional rules for alpha coding required to obtain the desired results from computer processing include:

a. When a WUC item operates in the same mode to perform more than one function, the same alpha code is used in each application.

b. When a WUC item operates in a different mode to perform each of more than one function, a different alpha designator is assigned for each operating mode.

C.3 FUNCTIONAL TABULATION

The "Flight Safety Functional Tabulation" sheet is used to code the safety model for keypunching. The sheets are coded as follows (refer to Figure C-1) for an example).

a. Columns 1 through 3. Used to identify the aircraft represented by the model. For certain aircraft modeled under this contract more than one model – designation series MDS – was included. For instance, a single functional deck was created for four MDSs of the F-4 aircraft. Cards with "F4ƀ"* in columns 1-3 were common to all aircraft. For example,

*ƀ = blank

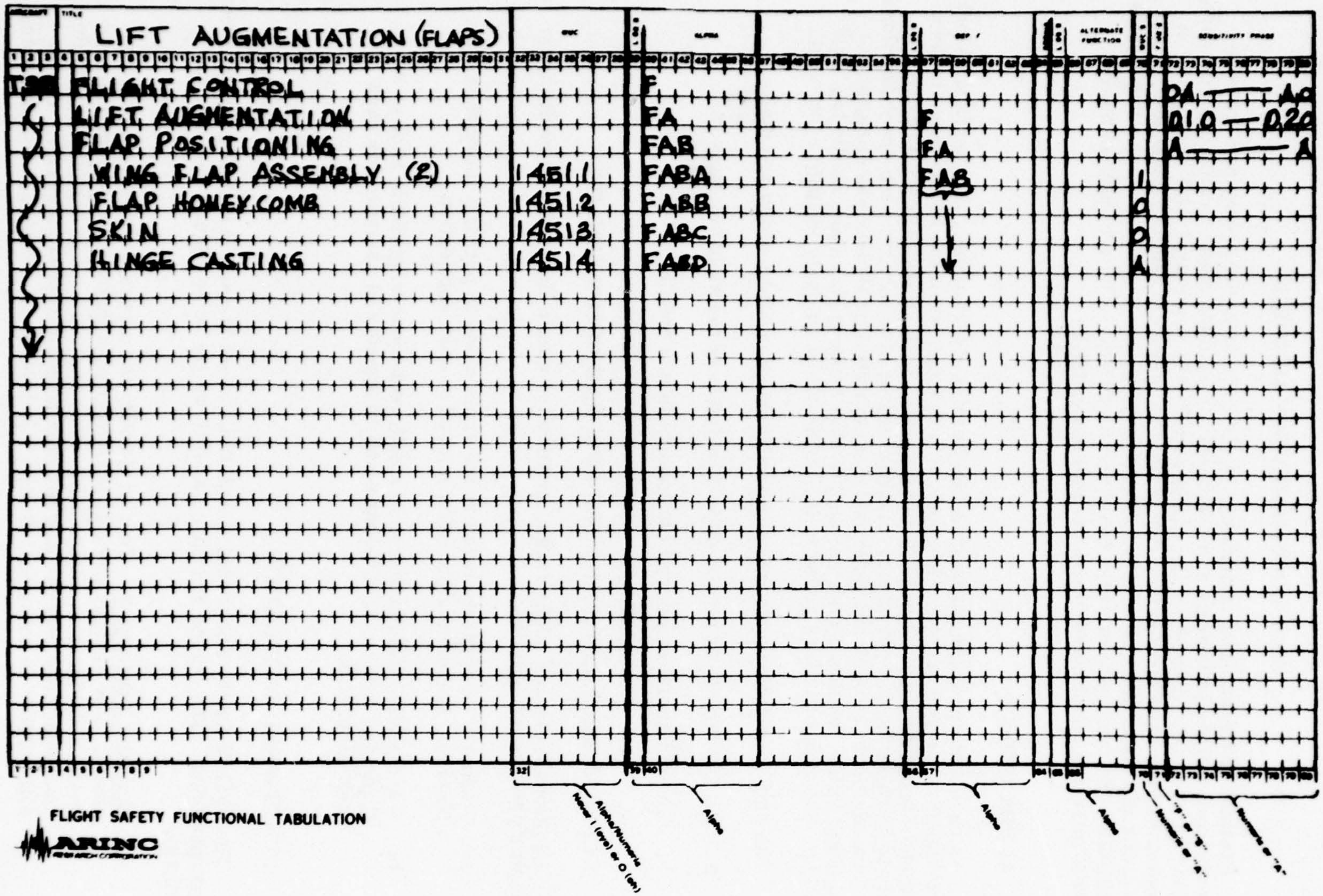


Figure C-1. Flight Safety Functional Tabulation

when these cards are combined with those carrying "F4E" in columns 1-3, then it produces an F-4E FSPT model deck.

b. Columns 4 through 31. Contain the title of the function or the WUC item.

c. Columns 32 through 36. Contain the left-justified WUC number.

d. Columns 37 and 38. Blank

e. Columns 39 through 46. Contain the assigned alpha designator for the function and/or the WUC. Column 39 contains either an L or an R, or is blank. The L and R designate left and right for those instances when the function and/or WUC pertains to the left or right side of the aircraft.

f. Columns 47 and 48. Blank.

g. Columns 49 through 55. Normally left blank, but are used after a deck is operational to substitute the data on a card for that stored in the computer by punching the line record number in this field.

h. Columns 56 through 63. Identify the dependent functions for either the function or specific WUCs being coded. Column 56 may contain L, R or blank for the same purpose as that of column 39.

i. Column 64. Contains the alphanumeric code of the "provisory factor" applicable to the link value assigned.

j. Columns 65 through 69. Contain the alpha designator of a function that is an alternate for the function being coded. (Column 65 is used for "L" or "R" as in Column 39.) The presence of the "alternate alpha" flags the importance of the link dependency as being affected by the success probability of the alternate function.

k. Column 70. Contains the work unit code dependency value (1 = 0.10; 2 = 0.20; ....A = 1.0). This value is applicable to all flight phases.

l. Column 71. Contains special instructions to the computer through the use of letters F, S, or being blank. Cards with an "S" or "blank" in column 71 are used in sensitivity computations. Cards with an "F" document a functional relationships which, although present in the system, would produce an erroneous sensitivity value when combined with other nonindependent paths (having the same function in common at some higher level). The "F" prevents the computer from including the link in the sensitivity calculations.

m. Columns 72 through 80. Contain functional dependencies for each of nine flight phases as described in Section 3.2.1 of the text. Coding is the same as for column 70.

C.4 DIAGRAM CONSTRUCTION

The diagrams produced under the contract document the functional interrelationship of the aircraft systems considered in the model. In the interest of extending the useful life of the diagrams, WUC items are not shown, thereby eliminating the necessity of updating the diagrams with each (and sometimes frequent) change to the WUC manual.

As discussed earlier in this report, the diagrams represent the hierarchal structure of the paths from which the sensitivity values are derived. The diagrams, although consistent with the system schematic and reliability block diagrams, are not equivalent due to this hierarchal method of documentation. In the actual system, signals and/or fluids pass from one component to the next and are thus documented in schematics; conversely, the hierarchal approach only identifies the components that must operate to achieve a given function, independent of the direction and/or sequence of signal flow. This approach directly addresses the system impact of a component failure without the necessity of identifying the intrasystem secondary failures. Each line connecting functions on the diagram is documented by a punchcard, with the lower function providing the "alpha designator" and the higher function's alpha designator indicator as the "dependent function". *

*The card deck also documents functional relationships not shown on the diagram; the work unit codes (mentioned earlier) and the "S" cards discussed in paragraph C.3.1.

APPENDIX D

FSPT DOCUMENTATION OF O-2 AIRCRAFT

FSPT DOCUMENTATION OF O-2 AIRCRAFT

This appendix contains the functional relationship diagrams and a listing of the keypunch cards that comprise the FSPT safety model documentation for the O-2A and O-2B aircraft.

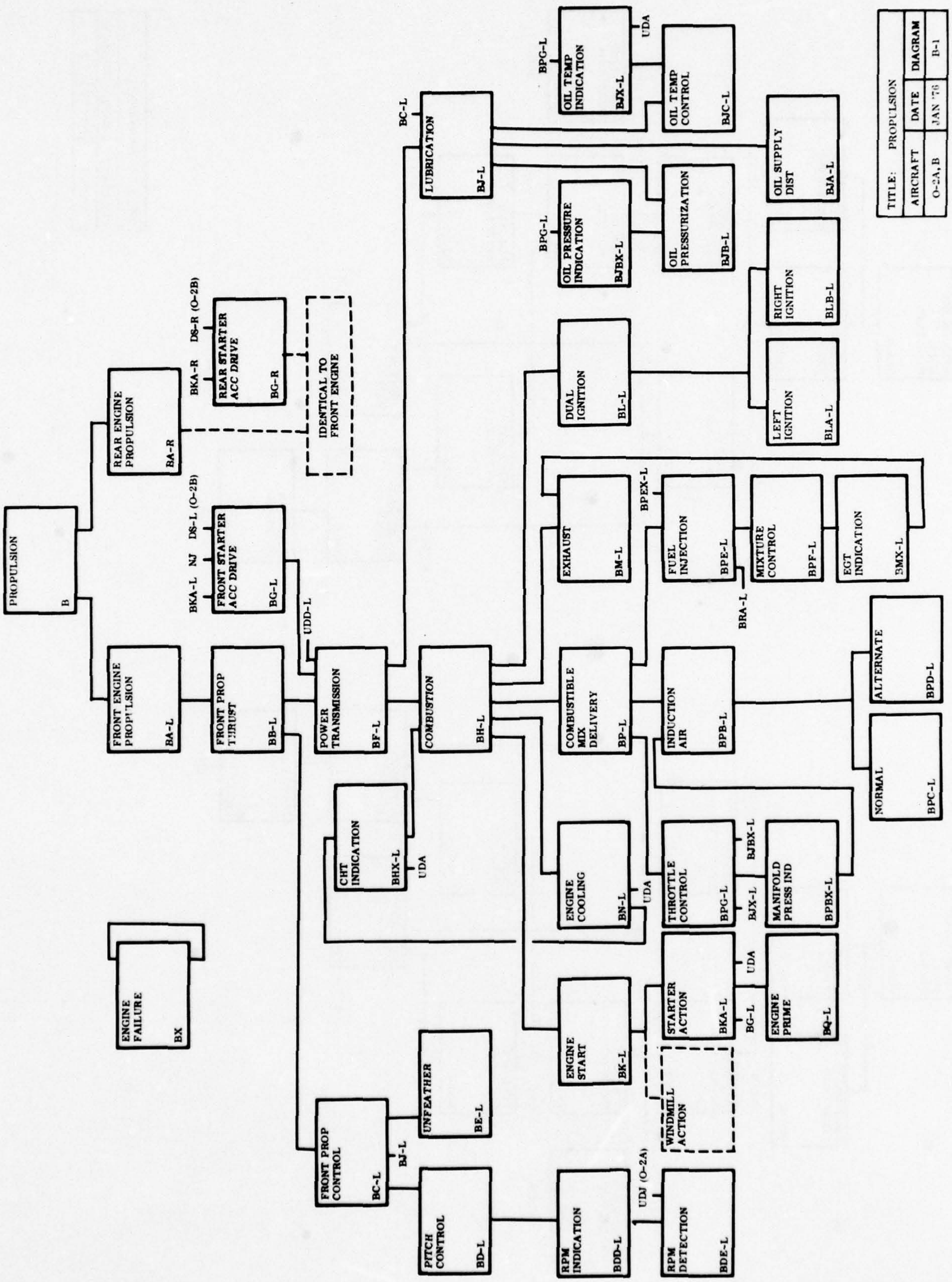
D.1 DIAGRAMS

The diagrams illustrating the functional relationships considered in the O-2 safety model are presented on pages D-5 through D-16, and are listed below:

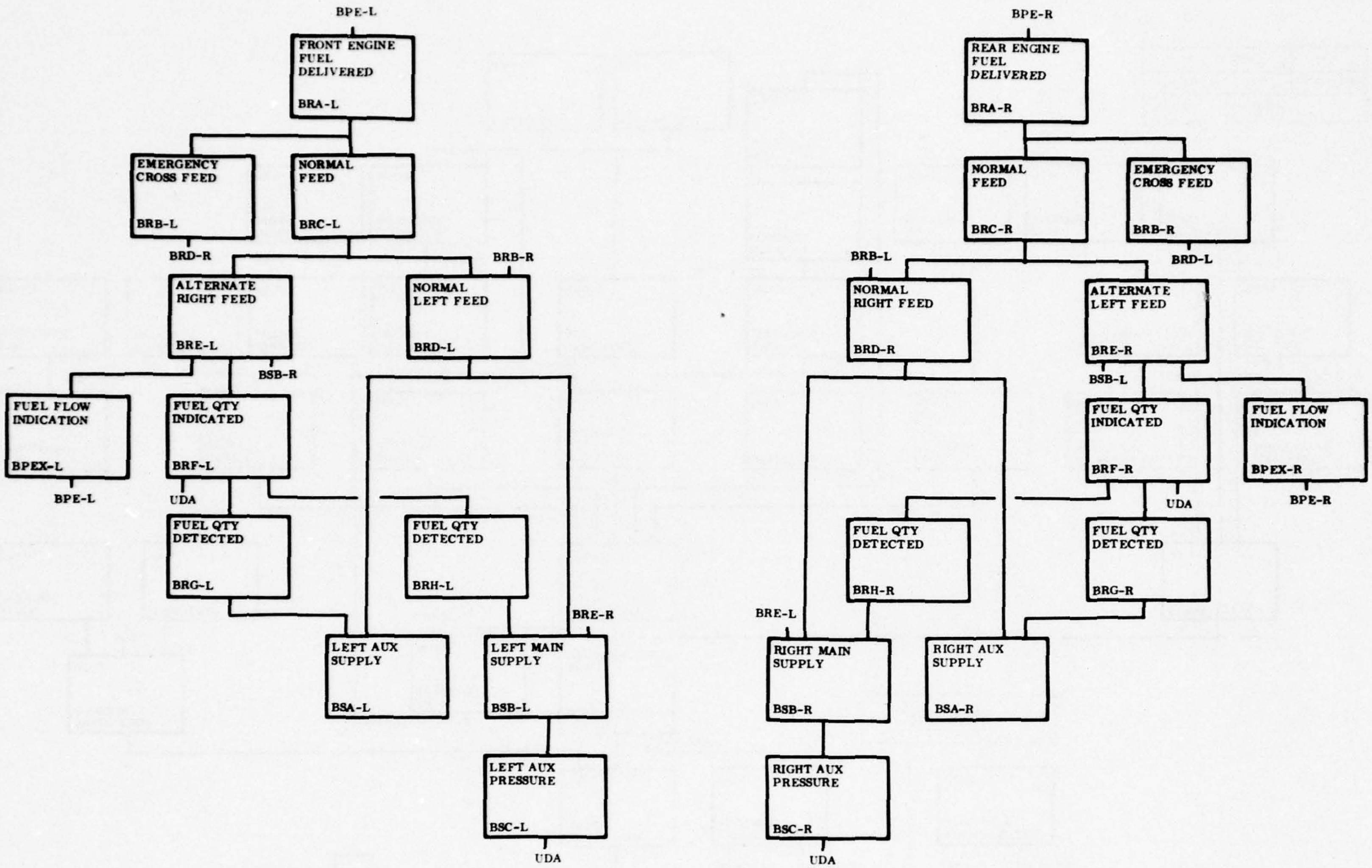
D.2 CARD LISTING

Pages D-17 through D-44 are a reproduction of the punchcard listing. The listing is alphabetical by "alpha designator", and the format is that of the 80-column punchcard itself as described in Appendix C. At the top of each page the card columns are printed vertically; for example, column 34 is printed "$\substack{3\\4}$"

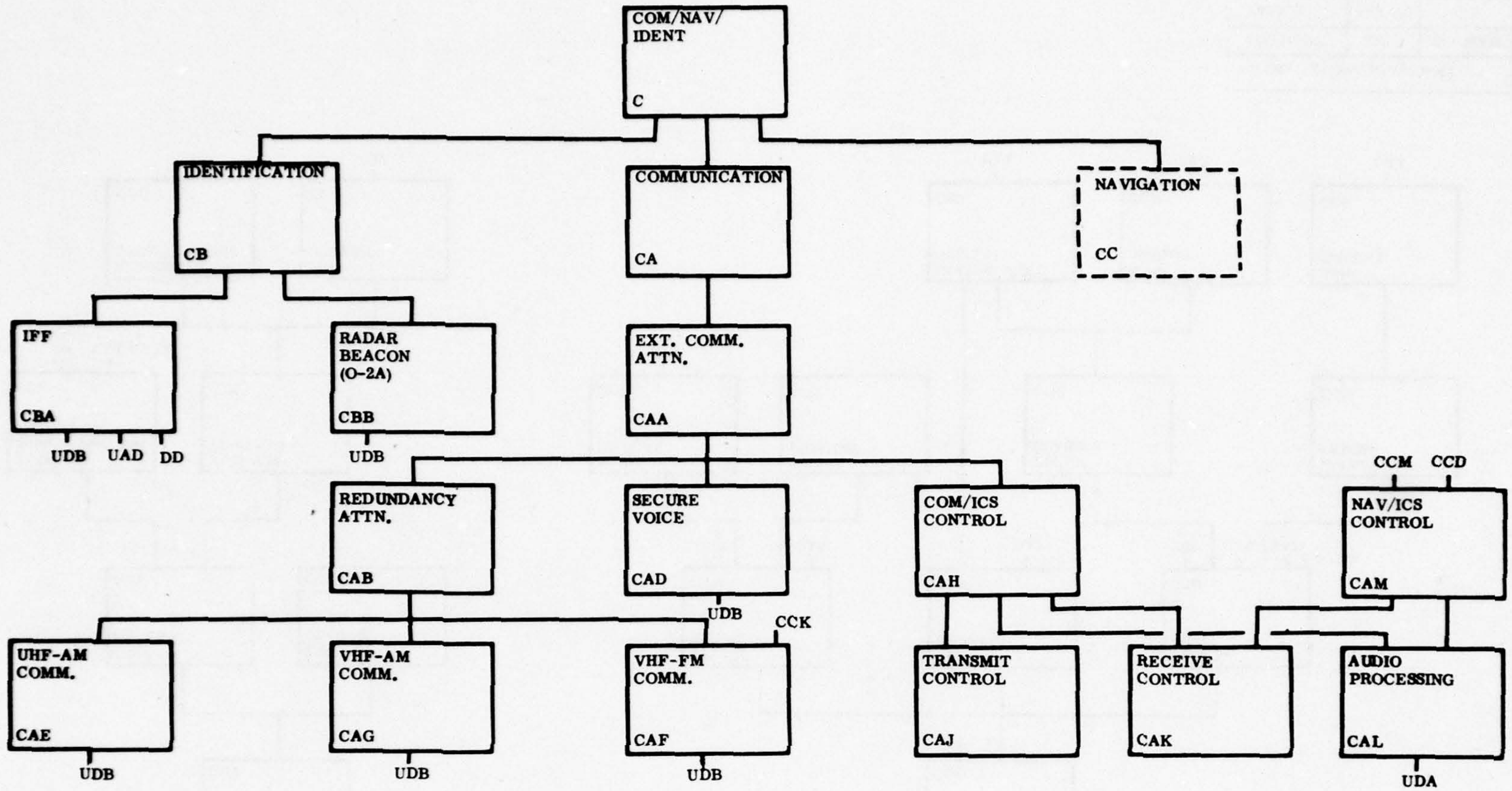
The first two columns of the punchcard are coded "O2". If the third column is blank, the card is common to both versions of the aircraft. Cards peculiar to one version of the aircraft carry a designator in column 3 for the aircraft – "A" for the O-2A and "B" for the O-2B.



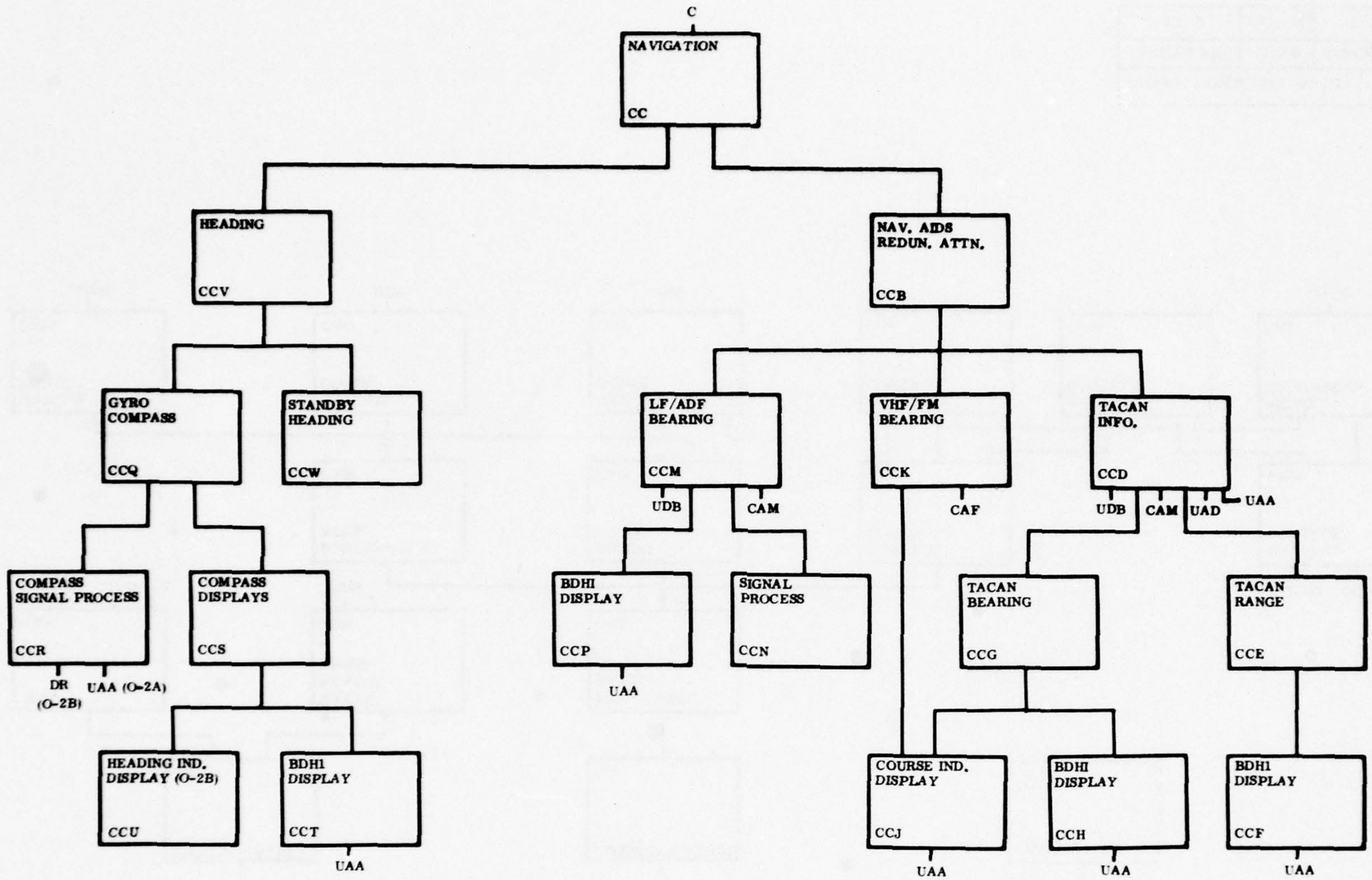
PROPULSION B
FRONT ENGINE PROPULSION BA-L
REAR ENGINE PROPULSION BA-R
BKA-L NJ DS-L (O-2B)
FRONT STARTER ACC DRIVE BG-L
BKA-R DS-R (O-2B)
REAR STARTER ACC DRIVE BG-R
IDENTICAL TO FRONT ENGINE
FRONT PROP THRUST BB-L
UDD-L
POWER TRANSMISSION BF-L
BC-L
LUBRICATION BJ-L
BPG-L
OIL TEMP INDICATION BJX-L
UDA
OIL TEMP CONTROL BJC-L
OIL SUPPLY DIST BJA-L
BPG-L
OIL PRESSURE INDICATION BJBX-L
OIL PRESSURIZATION BJB-L
DUAL IGNITION BL-L
RIGHT IGNITION BLB-L
LEFT IGNITION BLA-L
COMBUSTION BH-L
EXHAUST BM-L
BPEX-L
FUEL INJECTION BPE-L
BRA-L
MIXTURE CONTROL BPF-L
EGT INDICATION BMX-L
COMBUSTIBLE MIX DELIVERY BP-L
INDUCTION AIR BPB-L
ALTERNATE BPD-L
NORMAL BPC-L
CHT INDICATION BHX-L
UDA
ENGINE COOLING BN-L
UDA
THROTTLE CONTROL BPG-L
BJBX-L
BJX-L
MANIFOLD PRESS IND BPBX-L
ENGINE START BK-L
STARTER ACTION BKA-L
UDA
BG-L
ENGINE PRIME BQ-L
WINDMILL ACTION
ENGINE FAILURE BX
FRONT PROP CONTROL BC-L
BJ-L
UNFEATHER BE-L
PITCH CONTROL BD-L
RPM INDICATION BDD-L
UDJ (O-2A)
RPM DETECTION BDE-L
TITLE: PROPULSION
AIRCRAFT O-2A,B
DATE JAN '76
DIAGRAM B-1



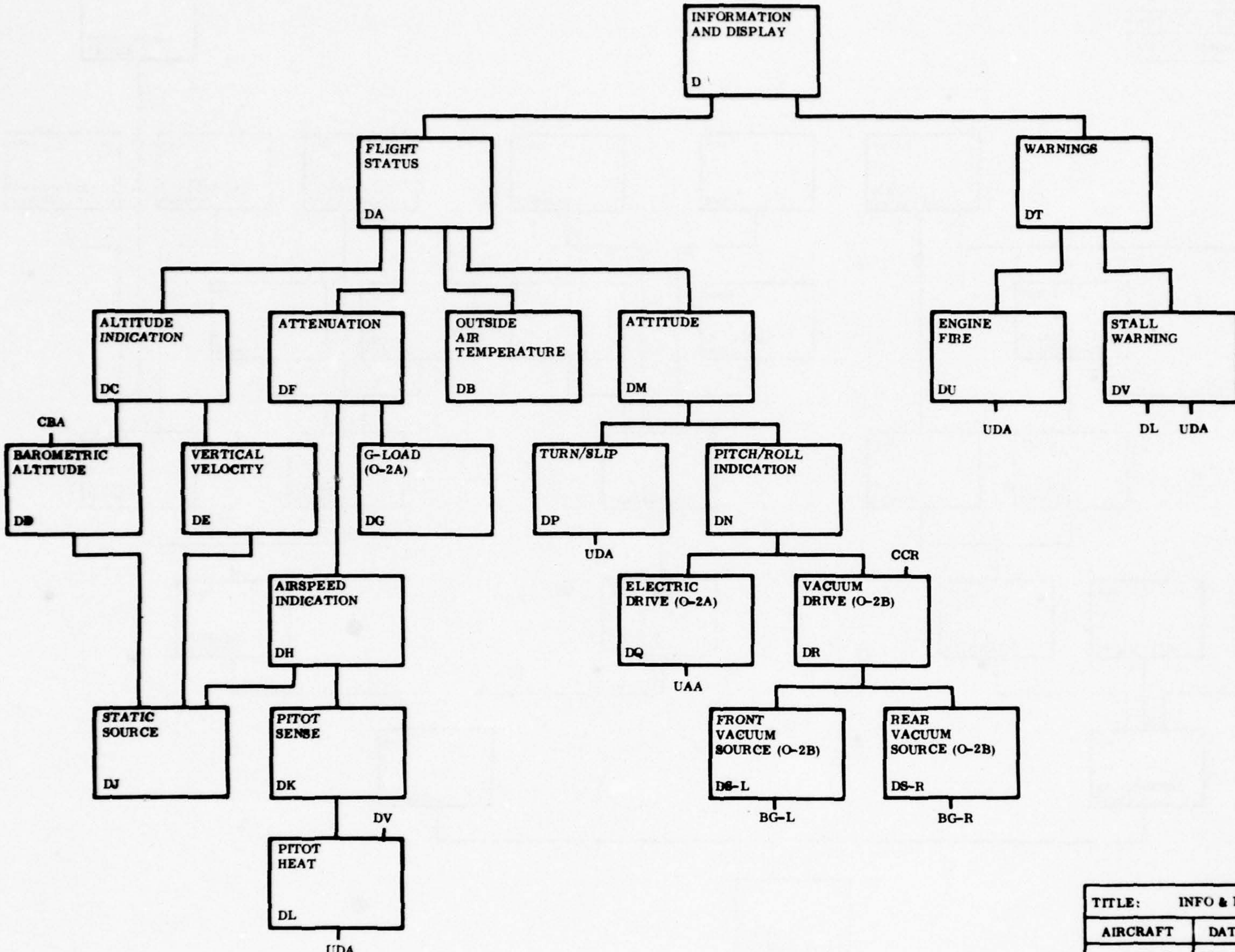
TITLE: PROPULSION		
AIRCRAFT	DATE	DIAGRAM
O-2A,B	JAN '76	B-2



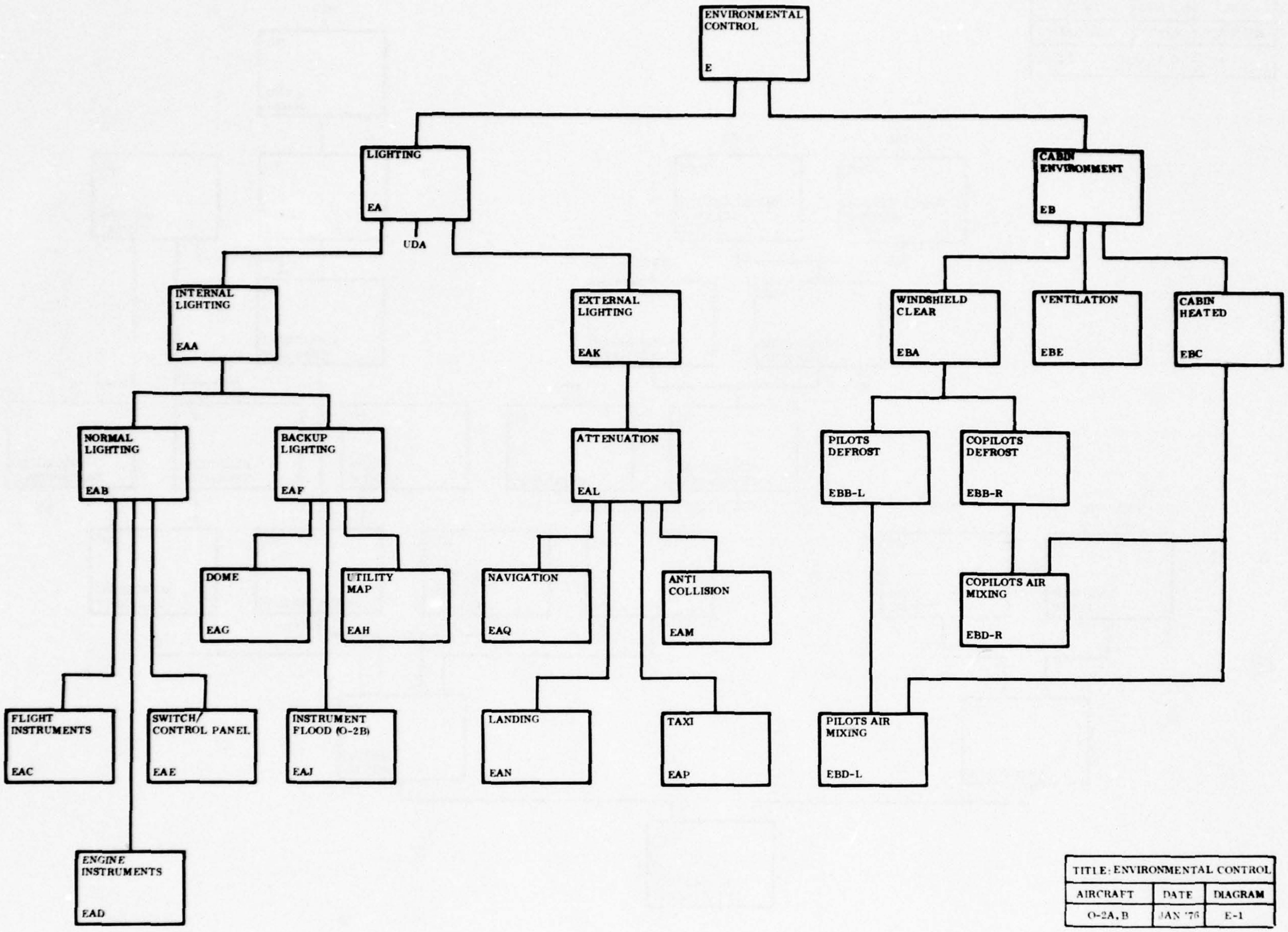
TITLE: COMM/NAV/IDENT		
AIRCRAFT	DATE	DIAGRAM
O-2A, B	JAN '76	C-1



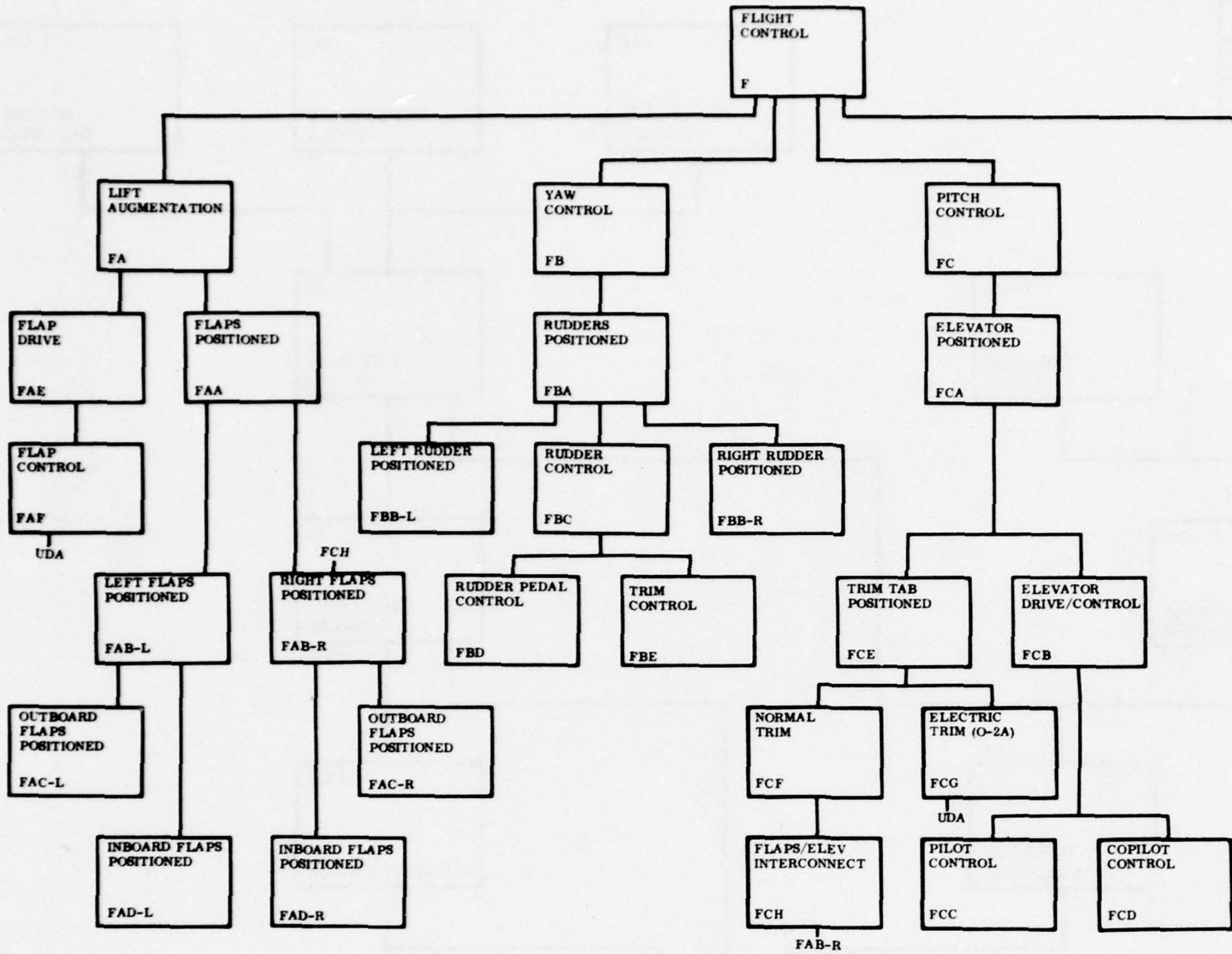
TITLE: COMM/NAV/IDENT		
AIRCRAFT	DATE	DIAGRAM
O-2A, B	JAN '76	C-2



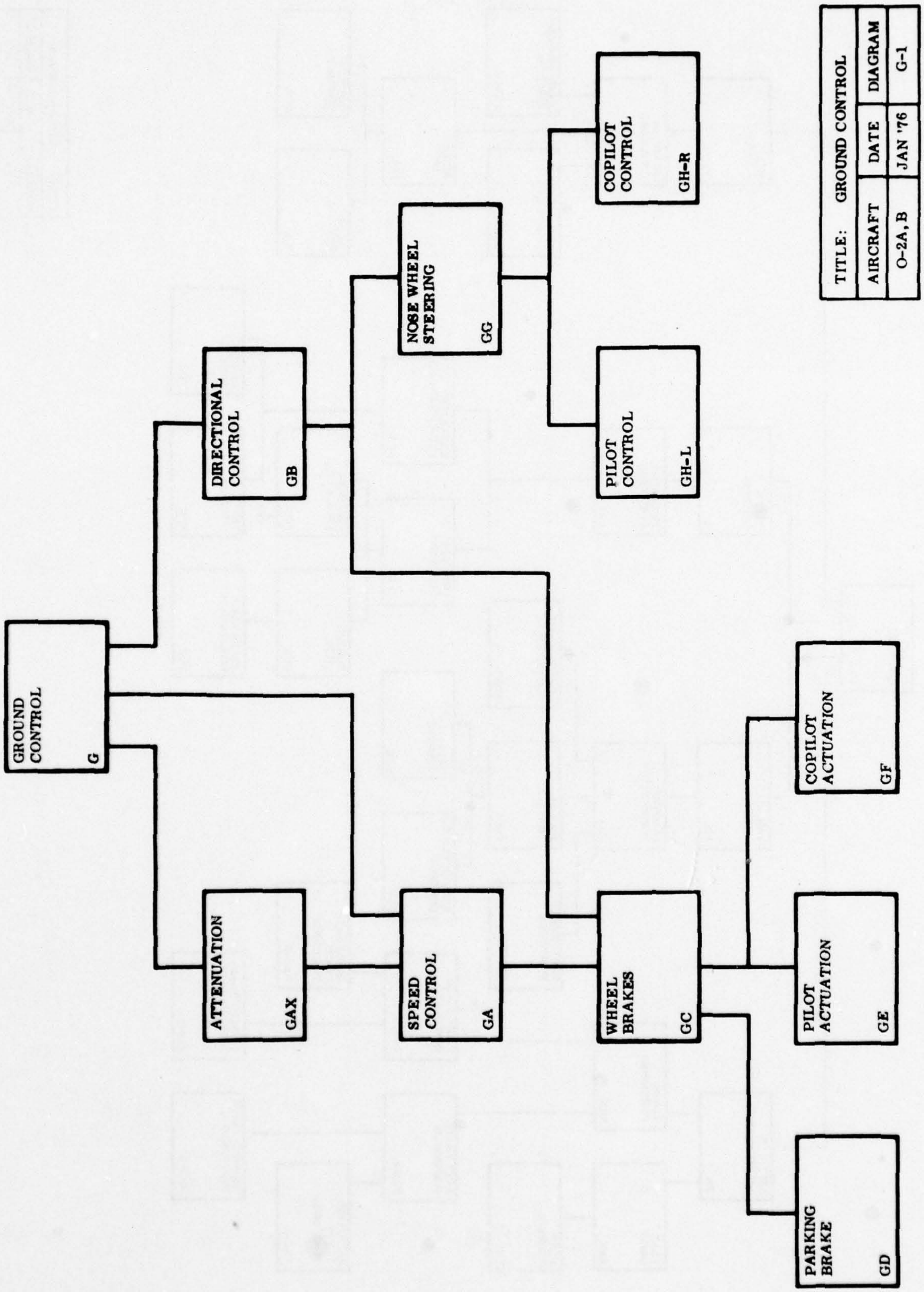
TITLE:	INFO & DISPLAY	
AIRCRAFT	DATE	DIAGRAM
O-2A, B	JAN '76	D-1

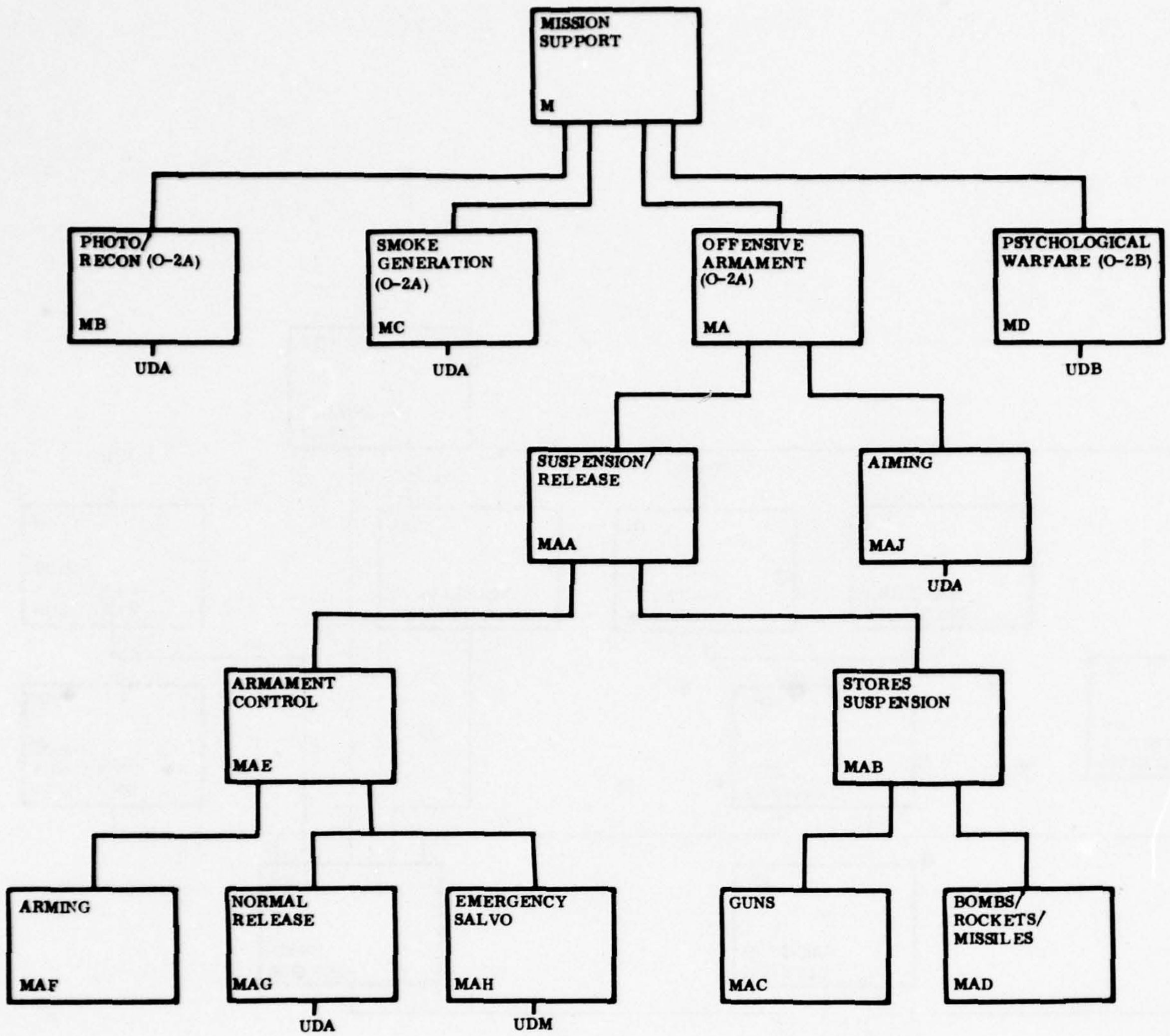


TITLE: ENVIRONMENTAL CONTROL		
AIRCRAFT	DATE	DIAGRAM
O-2A, B	JAN '76	E-1

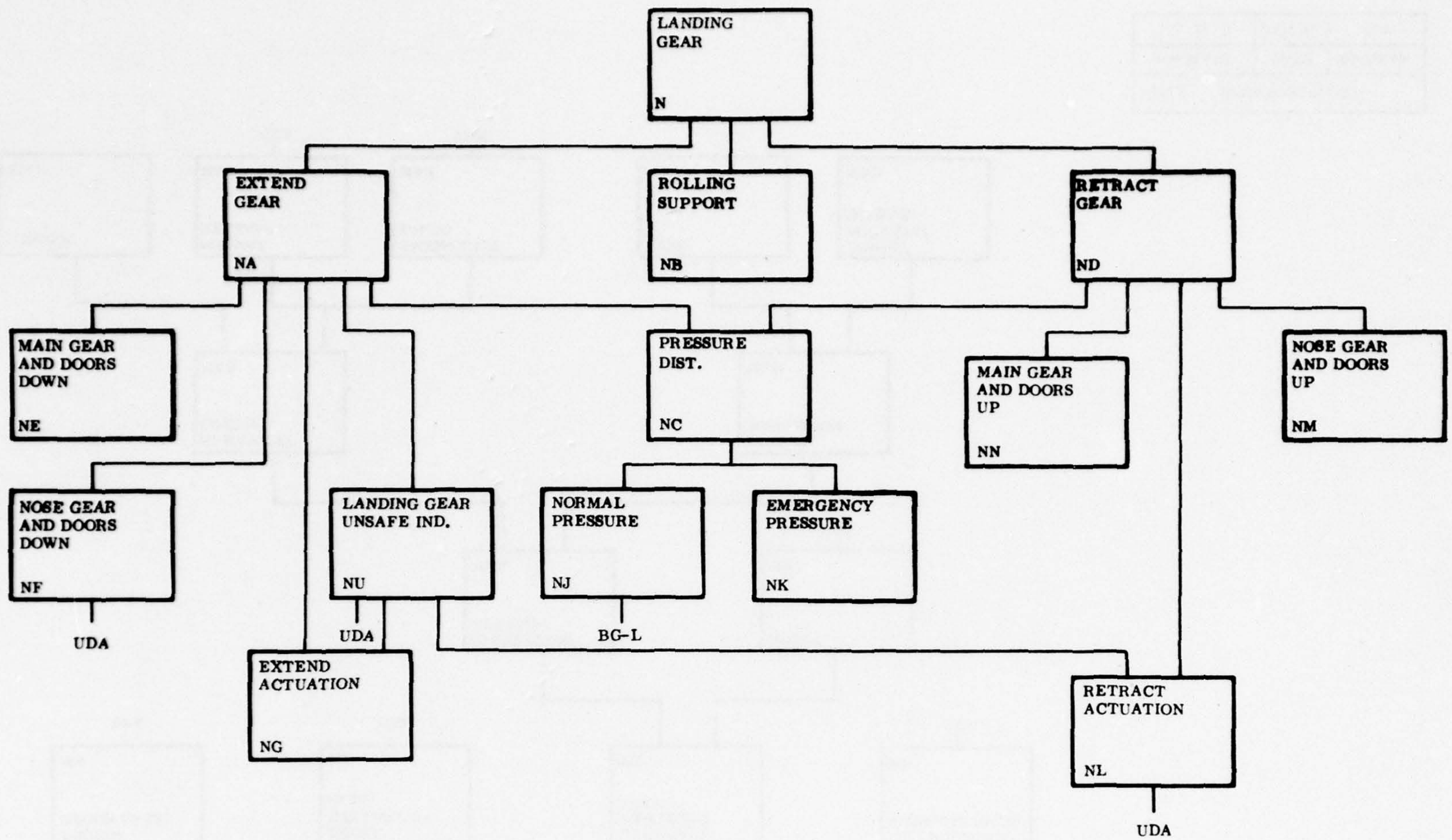


TITLE: FLIGHT CONTROL		
AIRCRAFT	DATE	DIAGRAM
O-2A,B	JAN '76	F-1

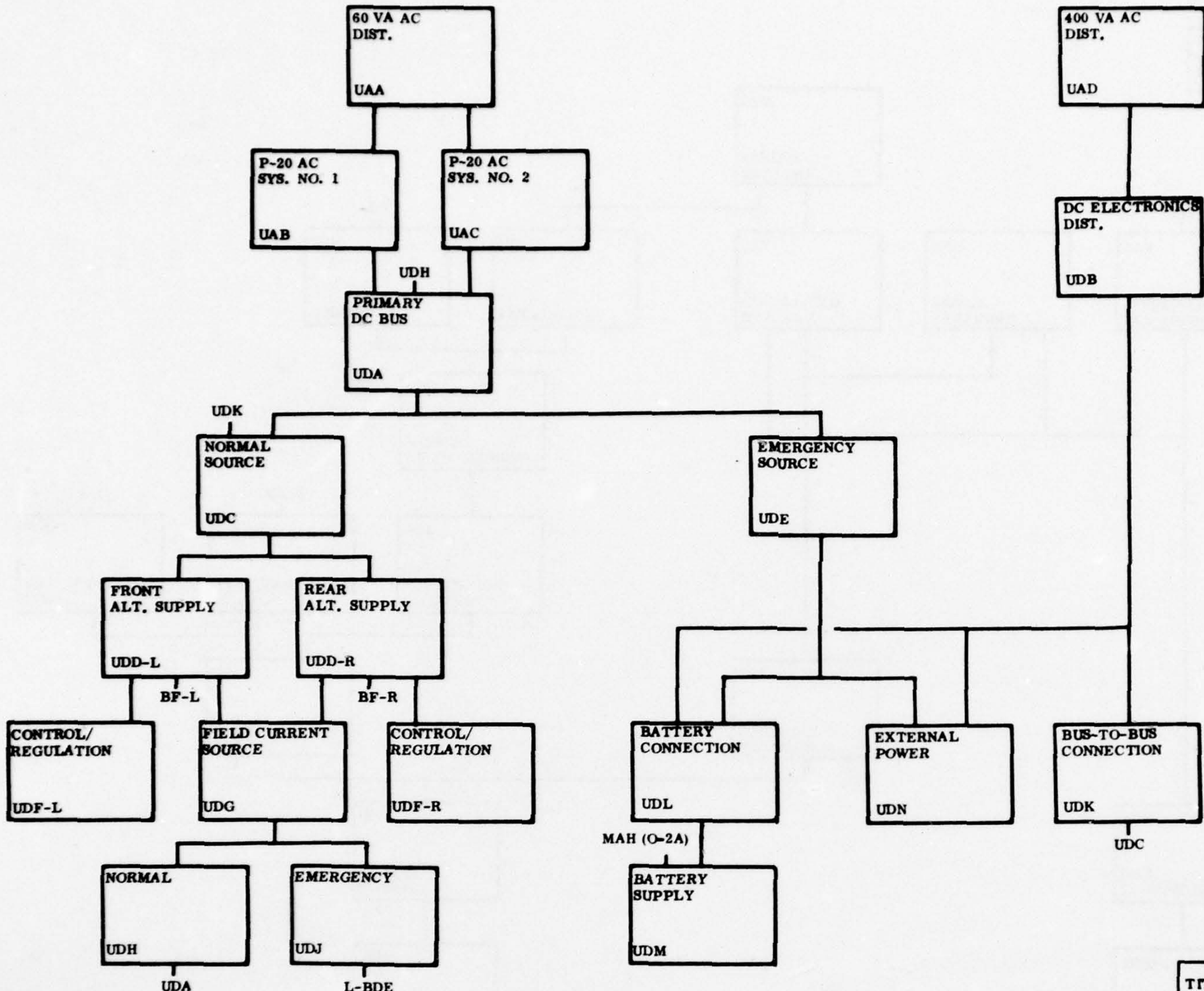

GROUND CONTROL G
DIRECTIONAL CONTROL GB
ATTENUATION GAX
SPEED CONTROL GA
NOSE WHEEL STEERING GG
WHEEL BRAKES GC
COPILOT CONTROL GH-R
PILOT CONTROL GH-L
COPILOT ACTUATION GF
PILOT ACTUATION GE
PARKING BRAKE GD
TITLE: GROUND CONTROL
AIRCRAFT O-2A, B
DATE JAN '76
DIAGRAM G-1



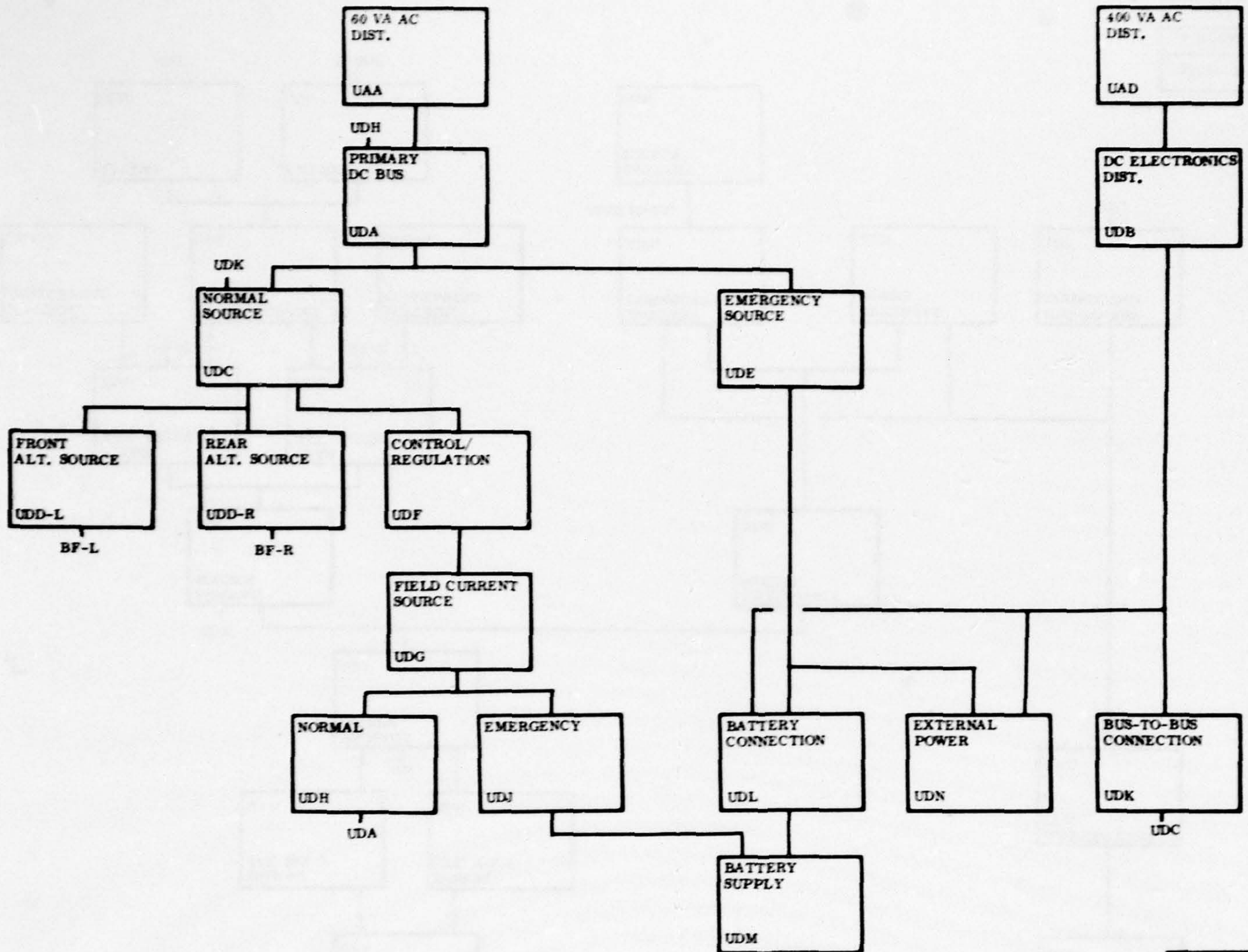
TITLE: MISSION SUPPORT		
AIRCRAFT	DATE	DIAGRAM
O-2A, B	JAN '76	M-1



TITLE: LANDING GEAR		
AIRCRAFT	DATE	DIAGRAM
O-2A, B	JAN '76	N-1



TITLE: UTILITIES		
AIRCRAFT	DATE	DIAGRAM
O-2A	JAN '76	U-1



TITLE: UTILITIES		
AIRCRAFT	DATE	DIAGRAM
O-2B	JAN '76	U-2

BEST AVAILABLE COPY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00000000011111111112222222222333333333344444444445555555555666666666677777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890
PGG095.J1CC 0-2          02 02A                          02A02B
02  PROPULSION                           B                                 AAAAAAAAA
02  FRONT ENGINE PROPULSION             LBA              B                 020000000
02  FRONT ENGINE PROPULSION             LBA              B         K BX    AAAAAAAAA
02  FRONT ENGINE PROPULSION             LBA              BX               SAAAAAAAAA
02  REAR  ENGINE PROPULSION             RBA              B                 030000000
02  REAR ENGINE PROPULSION              RBA              B         K BX    AAAAAAAAA
02   ENGINE MOUNTS %4 EA<      21LC0    LBAA            LBA          A
02   ENGINE MOUNTS %4 EA<      21LC0    RBAA            RBA          A
02   BISCUITS %8 EA<           21LAA    LBAB            LBA          0
02   BISCUITS %8 EA<           21LAA    RBAB            RBA          0
02   MOUNT ASSY- REAR          11AM1    RBAC            RBA          5
02  PROP THRUST                         LBB             LBA                AAAAAAAAA
02  PROP THRUST                         RBB             RBA                AAAAAAAAA
02   PROP ASSY FRONT           32AA0    LBBA            LBB          2
02   PROP ASSY REAR            32AB0    RBBA            RBB          2
02   BLADE %2 EA<              32AAA    LBBB            LBB          2
02   BLADE                     32ABA    RBBB            RBB          2
02   BALANCE WEIGHT            32AAB    LBBC            LBB          5
02   BALANCE WEIGHT            32ABB    RBBC            RBB          5
02   HUB ASSY                  32AAC    LBBD            LBB          2
02   HUB ASSY                  32ABC    RBBD            RBB          2
02   SPINNER ASSY              32AAF    LBBF            LBB          0
02   SPINNER ASSY              32ABF    RBBE            RBB          0
02  PROP CONTROL                        LBC             LBB                AAAAAAAAA
02  PROP CONTROL                        RBC             RBB                AAAAAAAAA
02   CYL ASSY FEATHER          32BAA    LBCA            LBC          A
02   CYL ASSY FEATHER          32BAA    RBCA            RBC          A
02   PIN,CYL LOCATING          32BAB    LBCB            LBC          A
02   PIN,CYL LOCATING          32BAB    RBCB            RBC          A
02   LATCH ASSY                32BAE    LBCC            LBC          5
02   LATCH ASSY                32BAF    RBCC            RBC          5
02   COUNTERWEIGHT             32BAF    LBCD            LBC          A
02   COUNTERWEIGHT             32BAF    RBCD            RBC          A
02   LEVER ASSY                32BAG    LBCE            LBC          2
02   LEVER ASSY                32BAG    RBCE            RBC          2
02   TELEX PUSH-PULL           32BAH    LBCF            LBC          2
02   TELEX PUSH-PULL           32BAH    RBCF            RBC          2
02   GOVERNOR                  32BAJ    LBCG            LBC          A
02   GOVERNOR                  32BAJ    RBCG            RBC          A
02   PUSH-ROD                  32BAK    LBCH            LBC          5
02   PUSH-ROD                  32BAK    RBCH            RBC          5
02   SPEEDER SPRING            32BAL    LBCJ            LBC          5
02   SPEEDER SPRING            32BAL    RBCJ            RBC          5
02   GEAR,PUMP DRIVE           32BAM    LBCK            LBC          A
02   GEAR,PUMP DRIVE           32BAM    RBCK            RBC          A
02   LIFT ROD                  32BAP    LBCL            LBC          2
02   LIFT ROD                  32BAP    RBCL            RBC          2
02   CONTROLEX                 32BAR    LBCM            LBC          2
02   CONTROLEX                 32BAR    RBCM            RBC          2
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02	PITCH CONTROL		LBD	LBC			AAAAAAAAA
02	PITCH CONTROL		RBD	RBC			AAAAAAAAA
02	STOP,FEATHERING	32BAC	LBDA	LBD		0	
02	STOP,FEATHERING	32BAC	RBDA	RBD		0	
02	PLATE,LO PITCH STOP	32BAD	LBDB	LBD		0	
02	PLATE,LO PITCH STOP	32BAD	RBDB	RBD		0	
02	VALVE RELIEF	32BAN	LBDC	LBD		8	
02	VALVE RELIEF	32BAN	RBDC	RBD		8	
02	RPM INDICATION		LBDD	LBD	KLBPBX		111111111
02	RPM INDICATION		RBDD	RBD	KRBPBX		111111111
02	TACH INDICATOR	21RA1	LBDDA	LBDD		8	
02	TACH INDICATOR	21RA1	RBDDA	RBDD		8	
02	RPM DETECTION		LBDE	LBDD			AAAAAAAAA
02A	RPM DETECTION		LBDE	UDJ			AAAAAAAAA
02	RPM DETECTION		RBDE	RBDD			AAAAAAAAA
02	TACH GENERATOR	21RAB	LBDEA	LBDE		A	
02	TACH GENERATOR	21RAB	RBDEA	RBDE		A	
02	FLEX SHAFT	21RAC	LBDEB	LBDE		A	
02	FLEX SHAFT	21FAC	RBDEB	RBDE		A	
02	REDUCTION DRIVE	21RAD	LBDEC	LBDE		A	
02	REDUCTION DRIVE	21RAD	RBDEC	RBDE		A	
02	DRIVE ADAPTER	21RAE	LBDED	LBDE		A	
02	DRIVE ADAPTER	21RAE	RBDED	RBDE		A	
02	UNFEATHER		LBE	LBC	T		AAAAAAAAA
02	UNFEATHER		RBE	RBC	T		AAAAAAAAA
02	ACCUMULATOR	32CAA	LBEA	LBE		A	
02	ACCUMULATOR	32CAA	RBEA	RBE		A	
02	UNFEATHER VALVE	32CAB	LBEB	LBE		A	
02	UNFEATHER VALVE	32CAB	RBEB	RBE		A	
02	HOSE	32CAC	LBEC	LBE		A	
02	HOSE	32CAC	RBEC	RBE		A	
02	POWER TRANSMISSION		LBF	LBB			AAAAAAAAA
02	POWER TRANSMISSION		LBF	LBG			FAAAAAAAAA
02	POWER TRANSMISSION		LBF	LUDD			FAAAAAAAAA
02	POWER TRANSMISSION		RBF	RBB			AAAAAAAAA
02	POWER TRANSMISSION		RBF	RBG			FAAAAAAAAA
02	POWER TRANSMISSION		RBF	RUDD			FAAAAAAAAA
02	CRANKCASE ASSY	21A00	LBFA	LBF		1	
02	CRANKCASE ASSY	21A00	RBFA	RBF		1	
02	HOUSING	21AAA	LBFB	LBF		1	
02	HOUSING	21AAA	RBFB	RBF		1	
02	BREATHER	21AAB	LBFC	LBF		0	
02	BREATHER	21AAB	RBFC	RBF		0	
02	OIL SEAL	21BAB	LBFD	LBF		1	
02	OIL SEAL	21BAB	RBFD	RBF		1	
02	CRANKSHAFT ASSY	21BAE	LBFE	LBF		A	
02	CRANKSHAFT ASSY	21BAE	RBFE	RBF		A	
02	CONNECTING ROD *6 EA<	21BAF	LBFF	LBF		8	
02	CONNECTING ROD *6 EA<	21BAF	RBFF	RBF		8	
02	CAMSHAFT AND GEAR	21BAK	LBFG	LBF		A	

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02   CAMSHAFT AND GEAR         21BAK  RBFG             RBF           A
02  FRONT ACCESSORY DRIVE             LBG              LBKA            AAAAAAAAA
02B FRONT ACCESSORY DRIVE             LBG              LDS             AAAAAAAAA
02  ACCESSORY DRIVE                   LBG               NJ             AAAAAAAAA
02  REAR ACCESSORY DRIVE              RBG              RBKA            AAAAAAAAA
02B REAR ACCESSORY DRIVE              RBG              RDS             AAAAAAAAA
02   ADAPTER-STARTER           21EAA  LBGA             LBG           A
02   ADAPTER-STARTER           21EAA  RBGA             RBG           A
02   ADAPTER-START/ACC DRIVE   21EAB  LBGB             LBG           A
02   ADAPTER-START/ACC DRIVE   21EAB  RBGB             RBG           A
02   CRANKCASE COVER ASSY      21EOO  LBGC             LBG           0
02   CRANKCASE COVER ASSY      21EOC  RBGC             RBG           0
02  COMBUSTION                        LBH              LBF             AAAAAAAAA
02  COMBUSTION                        LBH              LBHX           FAAAAAAAAA
02  COMBUSTION                        RBH              RBF             AAAAAAAAA
02  COMBUSTION                        RBH              RBHX           FAAAAAAAAA
02   CYLINDER ASSY %6 EA<      21COO  LBHA             LBH           1
02   CYLINDER ASSY %6 EA<      21COO  RBHA             RBH           1
02   VALVE,INTAKE  %6 EA<      21CAC  LBHB             LBH           2
02   VALVE,INTAKE  %6 EA<      21CAC  RBHB             RBH           2
02   EXHAUST VALVE %6 EA<      21CAD  LBHC             LBH           2
02   EXHAUST VALVE %6 EA<      21CAD  RBHC             RBH           2
02   ARM-ROCKER  % 12 EA<      21CAK  LBHD             LBH           1
02   ARM-ROCKER  % 12 EA<      21CAK  RBHD             RBH           1
02   SHAFT-ROCKER  %6EA<       21CAL  LBHE             LBH           1
02   SHAFT-ROCKER  %6EA<       21CAL  RBHE             RBH           1
02   LIFTER-HYD %12 EA<        21CAN  LBHF             LBH           1
02   LIFTER-HYD %12 EA<        21CAN  RBHF             RBH           1
02   ROD-PUSH   %12 EA<        21CAP  LBHG             LBH           1
02   ROD-PUSH   %12 EA<        21CAP  RBHG             RBH           1
02   PISTON ASSY  %6 EA<       21DOO  LBHH             LBH           2
02   PISTON ASSY  %6 EA<       21DOO  RBHH             RBH           2
02   RING                      21DAA  LBHJ             LBH           1
02   RING                      21DAA  RBHJ             RBH           1
02   PIN      %6 EA<           21DAB  LBHK             LBH           2
02   PIN      %6 EA<           21DAB  RBHK             RBH           2
02  CHT INDICATION                    LBHX             LBN             111111111
02  CHT INDICATION                    RBHX             RBN             111111111
02A  GAGE,COMBINATION          21RC1  LBHXA            LBHX          A
02A  GAGE,COMBINATION          21RC1  RBHXA            RBHX          A
02A  BULB,CHT                  21RCC  LBHXB            LBHX          A
02A  BULB,CHT                  21RCC  RBHXB            RBHX          A
02B  GAGE/PROBE ASSY           21RE1  LBHXC            LBHX          A
02B  GAGE/PROBE ASSY           21RE1  RBHXC            RBHX          A
02  LUBRICATION                       LBJ              LBC            FAAAAAAAAA
02  LUBRICATION                       LBJ              LBF             019999910
02  LUBRICATION                       RBJ              RBC            FAAAAAAAAA
02  LUBRICATION                       RBJ              RBF             019999910
02  OIL SUPPLY/DIST                   LBJA             LBJ             AAAAAAAAA
02  OIL SUPPLY/DIST                   RBJA             RBJ             AAAAAAAAA
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02     SUMP ASSY               21K00  LBJAA             LBJA          3
02     SUMP ASSY               21K00  RBJAA             RBJA          3
02     PLUG                    21KAA  LBJAB             LBJA          1
02     PLUG                    21KAA  RBJAB             RBJA          1
02     SCREENS                 21HAA  LBJAC             LBJA          0
02     SCREENS                 21HAA  RBJAC             RBJA          0
02   PRESSURIZATION                   LBJB              LBJ             AAAAAAAAA
02   PRESSURIZATION                   LBJB              LBJBX          FAAAAAAAAA
02   PRESSURIZATION                   RBJB              RBJ             AAAAAAAAA
02   PRESSURIZATION                   RBJB              RBJBX          FAAAAAAAAA
02     COVER OIL PUMP GEAR     21EAC  LBJBA             LBJB          0
02     COVER OIL PUMP GEAR     21EAC  RBJBA             RBJB          0
02     GEAR,OIL PUMP DRIVE     21HAC  LBJBB             LBJB          8
02     GEAR,OIL PUMP DRIVE     21HAC  RBJBB             RBJB          8
02     PUMP                    21HAD  LBJBC             LBJB          8
02     PUMP                    21HAD  RBJBC             RBJB          8
02     COVER OIL PUMP DRIVE    21HAE  LBJBD             LBJB          0
02     COVER OIL PUMP DRIVE    21HAE  RBJBD             RBJB          0
02     VALVE-PRESSURE RELIEF   21HAF  LBJBE             LBJB          3
02     VALVE-PRESSURE RELIEF   21HAF  RBJBE             RBJB          3
02   OIL PRESS INDICATION             LBJBX             LBPG    ILBJB   444444444
02   OIL PRESS INDICATION             RBJBX             RBPG    IRBJB   444444444
02A    GAGE COMBINATION        21RC1  LBJBXA            LBJBX         A
02A    GAGE COMBINATION        21RC1  RBJBXA            RBJBX         A
02B    GAGE,OIL PRESS          21RF1  LBJBXB            LBJBX         A
02B    GAGE,OIL PRESS          21RF1  RBJBXB            RBJBX         A
02A    CKT BKR COMBO GAGE      42FAB  LBJBXC            LBHX          A
02A    CKT  BKR  COMBO GAGE    42FAB  LBJBXC            LBJX          A
02A    CKT BKR COMBO GAGE      42FAB  RBJBXC            RBHX          A
02A    CKT  BKR  COMBO GAGE    42FAB  RBJBXC            RBJX          A
02   OIL TEMP CONTROL                 LBJC              LBJ             008888800
02   OIL TEMP CONTROL                 LBJC              LBJX           FAAAAAAAAA
02   OIL TEMP CONTROL                 RBJC              RBJ             008888800
02   OIL TEMP CONTROL                 RBJC              RBJX           FAAAAAAAAA
02     COOLER                  21HAB  LBJCA             LBJC          5
02     COOLER                  21HAB  RBJCA             RBJC          5
02     VALVE-VERNATHERM        21HAG  LBJCB             LBJC          5
02     VALVE-VERNATHERM        21HAG  RBJCB             RBJC          5
02   OIL TEMP INDICATION              LBJX              LBPG    ILBJC   333333333
02   OIL TEMP INDICATION              RBJX              RBPG    IRBJC   333333333
02A    GAGE,COMBINATION        21RC1  LBJXA             LBJX          A
02A    GAGE,COMBINATION        21RC1  RBJXA             RBJX          A
02A    BULB OIL TEMP           21RCB  LBJXB             LBJX          A
02A    BULB OIL TEMP           21RCB  RBJXB             RBJX          A
02B    GAGE/PROBE ASSY         21RD1  LBJXC             LBJX          A
02B    GAGE/PROBE ASSY         21RD1  RBJXC             RBJX          A
02   ENGINE START                     LBK               LBH     T       AAAAAAAAA
02   ENGINE START                     RBK               RBH     T       AAAAAAAAA
02   STARTER ACTION                   LBKA              LBK             111111111
02   STARTER ACTION                   RBKA              RBK             111111111
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02    STARTER                   21SAA  LBKAA              LBKA         A
02    STARTER                   21SAA  RBKAA              RBKA         A
02    CONTRACTOR                21SAC  LBKAB              LBKA         A
02    CONTRACTOO                21SAC  RBKAB              RBKA         A
02A   ENGINE STARTER BUTTON     9921A  LBKAC              LBKA         A
02A   ENGINE STARTER BUTTON     9921A  RBKAC              RBKA         A
02B   MAGNETO/STARTER SWITCH    9921B  LBKAD              LBKA         A
02B   MAGNETO/STARTER SWITCH    9921B  RBKAD              RBKA         A
02B   CKT BKR INST CLUSTER      42FAB  LBKAE              LBHX         A
02B   CKT BKR INST CLUSTER      42FAB  LBKAE              LBJX         A
02    CKT BKR START CONTROL     42FAB  LBKAE              LBKA         A
02B   CKT BKR INST CLUSTER      42FAB  RBKAE              RBHX         A
02B   CKT BKR INST CLUSTER      42FAB  RBKAE              RBJX         A
02    CKT BKR START CONTROL     42FAB  RBKAE              RBKA         A
02    CKT BKR                   42FAB  RBKAE              DU           A
02   DUAL IGNITION                     LBL                LBH              AAAAAAAAA
02   DUAL IGNITION                     RBL                RBH              AAAAAAAAA
02   LEFT IGNITION                     LBLA               LBL    KLBLB     AAAAAAAAA
02   LEFT IGNITION                     RBLA               RBL    KRBLB     AAAAAAAAA
02    MAGNETO                   21FAA  LBLAA              LBLA         A
02    MAGNETO                   21FAA  RBLAA              RBLA         A
02    SPARKPLUGS  %6 EA<        21FAC  LBLAB              LBLA         1
02    SPARKPLUGS  %6 EA<        21FAC  RBLAB              RBLA         1
02    HARNESS                   21FAB  LBLAC              LBLA         2
02    HARNESS                   21FAB  RBLAC              RBLA         2
02    FILTER                    21FAF  LBLAD              LBLA         2
02    FILTER                    21FAF  RBLAD              RBLA         2
02    MAGNETO SWITCH            9921B  LBLAE              LBLA         5
02    MAGNETO SWITCH            9921B  RBLAE              RBLA         5
02   RIGHT IGNITION                    LBLB               LBL    KLBLA     AAAAAAAAA
02   RIGHT IGNITION                    RBLB               RBL    KRBLA     AAAAAAAAA
02    MAGNETO                   21FAA  LBLBA              LBLB         A
02    MAGNETO                   21FAA  RBLBA              RBLB         A
02    SPARK PLUGS %6 EA<        21FAC  LBLBB              LBLB         1
02    SPARK PLUGS %6 EA<        21FAC  RBLBB              RBLB         1
02    HARNESS                   21FAB  LBLBC              LBLB         2
02    HARNESS                   21FAB  RBLBC              RBLB         2
02    FILTER                    21FAF  LBLBD              LBLB         2
02    FILTER                    21FAF  RBLBD              RBLB         2
02    MAGNETO SWITCH            9921B  LBLBE              LBLB         5
02    MAGNETO SWITCH            9921B  RBLBE              RBLB         5
02   EXHAUST                           LBM                LBH              AAAAAAAAA
02   EXHAUST                           LBM                LBMX            FAAAAAAAAA
02   EXHAUST                           RBM                RBH              AAAAAAAAA
02   EXHAUST                           RBM                RBMX            FAAAAAAAAA
02    RISER      FRONT %6 EA<   21NAA  LBMA               LBM          1
02    RISER      FRONT %6 EA<   21NAA  RBMA               RBM          1
02    MUFFLER    FRONT %2 EA<   21NAD  LBMB               LBM          1
02    MUFFLER    FRONT %2 EA<   21NAD  RBMB               RBM          1
02    SHROUD ASSY FRONT %2 EA<  21NAE  LBMC               LBM          0
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02   SHROUD ASSY FRONT %2 EA<  21NAE  RBMC            RBM           0
02   TAIL PIPE  FRONT %2 EA<   21NAF  LBMD            LBM           1
02   TAIL PIPE  FRONT %2 EA<   21NAF  RBMD            RBM           1
02   MOUNT SHOCK FRONT %2 EA<  21NAH  LBME            LBM           1
02   MOUNT SHOCK FRONT %2 EA<  21NAH  RBME            RBM           1
02   COLLECTOR/BALL ASSY FRONT 21NAL  LBMF            LBM           1
02   COLLECTOR/BALL ASSY FRONT 21NAL  RBMF            RBM           1
02   RISER      %6 EA<   REAR  21NBA  LBMG            LBM           1
02   RISER      %6 EA<   REAR  21NBA  RBMG            RBM           1
02   MUFFLER             REAR  21NBD  LBMH            LBM           1
02   MUFFLER             REAR  21NBD  RBMH            RBM           1
02   COLLECTOR/SOCKET ASSY REAR21NBE  LBMJ            LBM           1
02   COLLECTOR/SOCKET ASSY REAR21NBE  RBMJ            RBM           1
02   ELBOW/SOCKET ASSY  REAR   21NBF  LBMK            LBM           1
02   ELBOW/SOCKET ASSY  REAR   21NBF  RBMK            RBM           1
02  EGT INDICATION                    LBMX            LBPF             000000000
02  EGT INDICATION                    RBMX            RBPF             000000000
02   EGT INDICATOR             21RJ1  LBMXA           LBMX          A
02   EGT INDICATOR             21RJ1  RBMXA           RBMX          A
02   EGT PROBE                 21RJA  LBMXB           LBMX          A
02   EGT PROBE                 21RJA  RBMXB           RBMX          A
02   WIRING                    21RJB  LBMXC           LBMX          8
02   WIRING                    21RJB  RBMXC           RBMX          8
02  ENGINE COULING                    LBN             LBH              044111110
02  ENGINE COULING                    RBN             RBH              044111110
02   COWL FLAPS   %2 EA<       21PAA  LBNA            LBN           1
02   COWL FLAPS   %2 EA<       21PAA  RBNA            RBN           1
02   SWITCH CONTROL            21PAC  LBNB            LBN           A
02   SWITCH CONTROL            21PAC  RBNB            RBN           A
02   TORQUE TUBE               21PAE  LBNC            LBN           A
02   TORQUE TUBE               21PAE  RBNC            RBN           A
02   MOTOR                     21PAF  LBND            LBN           A
02   MOTOR                     21PAF  RBND            RBN           A
02   CONTROL RODS %2 EA<       21PAG  LBNE            LBN           5
02   CONTROL RODS %2 EA<       21PAG  RBNE            RBN           5
02   SWITCH,LIMIT              21PAJ  LBNF            LBN           5
02   SWITCH,LIMIT              21PAJ  RBNF            RBN           5
02   AIRSCOOP ASSY %REAR<      11EBA  RBNG            RBN           1
02   CYL BAFFLE ASSY           21CAT  LBNH            LBN           1
02   CYL BAFFLE ASSY           21CAT  RBNH            RBN           1
028  CKT BKR COWL FLAPS        42FAB  LBNJ            LBN           A
028  CKT BKR COWL FLAPS        42FAB  RBNJ            RBN           A
02  COMBUSTIBLE MIX DELIVERY          LBP             LBH              AAAAAAAAA
02  COMBUSTIBLE MIX DELIVERY          RBP             RBH              AAAAAAAAA
02   AIR THROTTLE/FUEL METER AS21GAB  LBPA            LBP           2
02   AIR THROTTLE/FUEL METER AS21GAB  RBPA            RBP           2
02  INDUCTION AIR                     LBPB            LBP              AAAAAAAAA
02  INDUCTION AIR                     LBPB            LBPBX           FAAAAAAAAA
02  INDUCTION AIR                     RBPB            RBP              AAAAAAAAA
02  INDUCTION AIR                     RBPB            RBPBX           FAAAAAAAAA
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02	AIRBOX ASSY	21JAC	LBPBA	LBPB		5
02	AIRBOX ASSY	21JAC	RBPBA	RBPB		5
02	MANIFOLD,FUTAKE	21JAJ	LBPBB	LBPB		1
02	MANIFOLD,FUTAKE	21JAJ	RBPBB	RBPB		1
02	TUBE ASSY	21JAB	LBPBC	LBPB		1
02	TUBE ASSY	21JAB	RBPBC	RBPB		1
02	AIR INDUCTION CONT LEVER	21MAE	LBPBD	LBPB		A
02	AIR INDUCTION CONT LEVER	21MAE	RBPBD	RBPB		A
02	AIR INDUCTION TELEFLEX	21MAF	LBPBE	LBPB		A
02	AIR INDUCTION TELEFLEX	21MAF	RBPBE	RBPB		A
02	MANIFOLD PRESS IND		LBPBX	LBPG	KLBDD	111111111
02	MANIFOLD PRESS IND		RBPBX	RBPG	KRBDD	111111111
02	GAGE,MAN PRESS	21RG1	LBPBXA	LBPBX		8
02	GAGE,MAN PRESS	21RG1	RBPBXA	RBPBX		8
02	NORMAL INDUCTION AIR		LBPC	LBPB	LBPD	111111111
02	NORMAL INDUCTION AIR		RBPC	RBPB	RBPD	111111111
02	FILTER	21JAA	LBPCA	LBPC		1
02	FILTER	21JAA	RBPCA	RBPC		1
02	ALTERNATE INDUCTION AIR		LBPD	LBPB	KLBPC	AAAAAAAAA
02	ALTERNATE INDUCTION AIR		RBPD	RBPB	KRBPC	AAAAAAAAA
02	DUCT ALT AIR	21JAG	LBPDA	LBPD		0
02	DUCT ALT AIR	21JAG	RBPDA	RBPD		0
02B	LEVER AIR INDUCTION CONTRO	21MAE	LBPDB	LBPD		A
02B	LEVER AIR INDUCTION CONTRO	21MAE	RBPDB	RBPD		A
02B	TELEFLEX	21MAF	LBPDC	LBPD		A
02B	TELEFLEX	21MAF	RBPDC	RBPD		A
02	SPRING	21JAK	LBPDD	LBPD		1
02	SPRING	21JAK	RBPDD	RBPD		1
02	FUEL INJECTION		LBPE	LBP		AAAAAAAAA
02	FUEL INJECTION		LBPE	LBPEX		FAAAAAAAA
02	FUEL INJECTION		RBPE	RBP		AAAAAAAAA
02	FUEL INJECTION		RBPE	RBPEX		FAAAAAAAA
02	PUMP/VAPOR SEP	21GAA	LBPEA	LBPE		4
02	PUMP/VAPOR SEP	21GAA	RBPEA	RBPE		4
02	FUEL MANIFOLD VALVE	21GAC	LBPEB	LBPE		8
02	FUEL MANIFOLD VALVE	21GAC	RBPEB	RBPE		8
02	HOSE	21GAD	LBPEC	LBPE		A
02	HOSE	21GAD	RBPEC	RBPE		A
02	NOZZLES %6 EA<	21GAE	LBPED	LBPE		2
02	NOZZLES %6 EA<	21GAE	RBPED	RBPE		2
02	TUBES	21GAF	LBPEE	LBPE		8
02	TUBES	21GAF	RBPEE	RBPE		8
02	FUEL FLOW INDICATION		LBPEX	LBRE	ILBRD	111111111
02	FUEL FLOW INDICATION		RBPEX	RBRE	IRBRD	111111111
02	INDICATOR	21RH1	LBPEXA	LBPEX		A
02	INDICATOR	21RH1	RBPEXA	RBPEX		A
02	MIXTURE CONTROL		LBPF	LBPE		555555555
02	MIXTURE CONTROL		RBPF	RBPE		555555555
02	LEVER,MIXTURE	21MAC	LBPFA	LBPF		A
02	LEVER,MIXTURE	21MAC	RBPFA	RBPF		A

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PGGP95.JLRL   DATE = 01/12/76   FLIGHT SAFETY PREDICTION TECHNIQUE

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02	TELEFLEX	21MAK	21MAD	LBPFB	LBPF		A
02	TELEFLEX	21MAK	21MAD	RBPFB	RBPF		A
02	CONTROLEX	21MAD	21MAK	LBPFC	LBPF		A
02	CONTROLEX	21MAD	21MAK	RBPFC	RBPF		A
02	THROTTLE CONTROL			LBPG	LBP		AAAAAAAAA
02	THROTTLE CONTROL			RBPG	RBP		AAAAAAAAA
02	THROTTLE LEVER		21MAA	LBPGA	LBPG		A
02	THROTTLE LEVER		21MAA	RBPGA	RBPG		A
02	TELEFLEX	21MAJ	21MAB	LBPGB	LBPG		2
02	TELEFLEX	21MAJ	21MAB	RBPGB	RBPG		2
02	CONTROLEX	21MAB	21MAJ	LBPGC	LBPG		2
02	CONTROLEX	21MAB	21MAJ	RBPGC	RBPG		2
02	ENGINE PRIMING			LBQ	LBKA	Y	511111111
02	ENGINE PRIMING			RBQ	RBKA	Y	511111111
02	PRIMING CONTROL		21QAA	LBQA	LBQ		A
02	PRIMING CONTROL		21QAA	RBQA	RBQ		A
02	ENGINE FUEL DELIVERED			LBRA	LBPE		AAAAAAAAA
02	ENGINE FUEL DELIVERED			RBRA	RBPE		AAAAAAAAA
02	FUEL STRAINER		46DAB	LBRAA	LBRA		1
02	FUEL STRAINER		46DAB	RBRAA	RBRA		1
02	STRAINER DRAIN KNOB		46DAC	LBRAB	LBRA		0
02	STRAINER DRAIN KNOB		46DAC	RBRAB	RBRA		0
02	VAPOR RETURN CHECK VALVE		46DAF	LBRAC	LBRA		1
02	VAPOR RETURN CHECK VALVE		46DAF	RBRAC	RBRA		1
02	HOSE- UNION/FIREWALL		46DAG	LBRAD	LBRA		8
02	HOSE- PUMP/UNION		46DAH	LBRAE	LBRA		8
02	HOSE- PUMP/FILTER		46DAJ	LBRAF	LBRA		8
02	HOSE- FUEL FLOW		46DAK	LBRAG	LBRA		8
02	HOSE- PUMP/FIREWALL		46DAL	RBRAH	RBRA		8
02	HOSE- PUMP/FILTER		46DAM	RBRAJ	RBRA		8
02	HOSE- FUEL FLOW		46DAN	RBRAK	RBRA		8
02	EMERGENCY CROSS FEED			LBRB	LBRA	KLBRC	AAAAAAAAA
02	EMERGENCY CROSS FEED			RBRB	RBRA	KRBRC	AAAAAAAAA
02	VALVE		46EAF	LBRBA	LBRB		A
02	VALVE		46EAF	RBRBA	RBRB		A
02	NORMAL FEED			LBRC	LBRA	LBRB	111111111
02	NORMAL FEED			RBRC	RBRA	RBRB	111111111
02	SELECTOR VALVE		46DAD	LBRCA	LBRC		A
02	SELECTOR VALVE		46DAD	RBRCA	RBRC		A
02	GEARBOX		46EAB	LBRCB	LBRC		A
02	GEARBOX		46EAB	RBRCB	RBRC		A
02	HANDLE SELECTOR		46EAC	LBRCC	LBRC		A
02	HANDLE SELECTOR		46EAC	RBRCC	RBRC		A
02	CABLE FUEL SELECTOR		46EAD	LBRCD	LBRC		A
02	CABLE FUEL SELECTOR		46EAD	RBRCD	RBRC		A
02	NORMAL LEFT FEED			LBRD	RBRB		AAAAAAAAA
02	NORMAL LEFT/RIGHT FEED			LBRD	LBRC	LBRE	111111111
02	NORMAL RIGHT FEED			RBRD	LBRB		AAAAAAAAA
02	NORMAL LEFT/RIGHT FEED			RBRD	RBRC	RBRE	111111111
02	ALTERNATE LEFT/RIGHT FEED			LBRE	LBRC	KLBRD	AAAAAAAAA

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02   ALTERNATE LEFT/RIGHT FEED              RBRE             RBRC    KRBRD    AAAAAAAAA
02   FUEL QTY INDICATED                     LBRF             LBRF             111111111
02   FUEL QTY INDICATED                     RBRF             RBRF             111111111
02     GAGE                        46GAA    LBRFA            LBRF          8
02     GAGE                        46GAA    RBRFA            RBRF          8
02B    SELECTOR SWITCH             46GAB    LBRFB            LBRF          A
02B    SELECTOR SWITCH             46GAB    RBRFB            RBRF          A
02A    MICROSWITCH                 46GAC    LBRFC            LBRF          A
02A    MICROSWITCH                 46GAC    RBRFC            RBRF          A
02A    HANDLE SELECTOR             46EAC    LBRFD            LBRF          A
02A    HANDLE SELECTOR             46EAC    RBRFD            RBRF          A
02A    GEARBOX                     46EAB    LBRFE            LBRF          A
02A    GEARBOX                     46EAB    RBRFE            RBRF          A
02A  CKT BKR COWLFLAPS             42FAB    LBRFG            LBN           A
02     CKT BKR                     42FAB    LBRFG            LBRF          A
02A  CKT BKR COWLFLAPS             42FAB    RBRFG            RBN           A
02     CKT BKR                     42FAB    RBRFG            RBRF          A
02   FUEL QTY DET %AUX<                     LBRG             LBRF             222222222
02   FUEL QTY DET %AUX<                     RBRG             RBRF             222222222
02     TRANSMITTER.QTY AUX         46GAF    LBRGA            LBRG          8
02     TRANSMITTER.QTY AUX         46GAF    RBRGA            RBRG          8
02   FUEL QTY DET%MAIN<                     LBRH             LBRF             888888888
02   FUEL QTY DET%MAIN<                     RBRH             RBRF             888888888
02     TRANSMITTER  %OUTBD<        46GAD    LBRHA            LBRH          8
02     TRANSMITTER  %OUTBD<        46GAD    RBRHA            RBRH          8
02     TRANSMITTER  %IN BD<        46GAE    LBRHB            LBRH          8
02     TRANSMITTER  %IN BD<        46GAE    RBRHB            RBRH          8
02   AUX SUPPLY                             LBSA             LBRD             222222222
02   AUX SUPPLY                             LBSA             LBRG            FAAAAAAAAA
02   AUX SUPPLY                             RBSA             RBRD             222222222
02   AUX SUPPLY                             RBSA             RBRG            FAAAAAAAAA
02     AUX TANK ASSY               46CAA    LBSAA            LBSA          9
02     AUX TANK ASSY               46CAA    RBSAA            RBSA          9
02     VALVE QUICK DRAIN           46CAC    LBSAB            LBSA          1
02     VALVE QUICK DRAIN           46CAC    RBSAB            RBSA          1
02   MAIN SUPPLY                            LBSB             LBRD             888888888
02   LEFT MAIN SUPPLY                       LBSB             RBRE             AAAAAAAAA
02   MAIN SUPPLY                            LBSB             LBRH            FAAAAAAAAA
02   MAIN SUPPLY                            RBSB             RBRD             888888888
02   RIGHT MAIN SUPPLY                      RBSB             LBRE             AAAAAAAAA
02   MAIN SUPPLY                            RBSB             RBRH            FAAAAAAAAA
02     MAIN TANK ASSY              46AAA    LBSBA            LBSB          9
02     MAIN TANK ASSY              46AAA    RBSBA            RBSB          9
02     HOSE INTERCONNECT           46AAC    LBSBB            LBSB          9
02     HOSE INTERCONNECT           46AAC    RBSBB            RBSB          9
02     VALVE VENT LINE CHECK       46AAD    LBSBC            LBSB          3
02     VALVE VENT LINE CHECK       46AAD    RBSBC            RBSB          3
02     SUMP TANK ASSY              46BAA    LBSBD            LBSB          A
02     SUMP TANK ASSY              46BAA    RBSBD            RBSB          A
02     VALVE QUICK DRAIN           46BAB    LBSBE            LBSB          1
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02   VALVE QUICK DRAIN         46BAB   RBSBE           RBSB          1
02  AUX PRESSURE                       LBSC            LBSB            111111111
02  AUX PRESSURE                       RBSC            RBSB            111111111
02   AUX PUMP                  46DAA   LBSCA           LBSC          A
02   AUX PUMP                  46DAA   RBSCA           RBSC          A
02   AUX PUMP SWITCH           46EAA   LBSCB           LBSC          A
02   AUX PUMP SWITCH           46EAA   RBSCB           RBSC          A
02   CKT BKR AUX PUMP          42FAB   LBSCC           LBSC          A
02   CKT BKR AUX PUMP          42FAB   RBSCC           RBSC          A
02    CKT BKR                  42FAB   RBSCC           DP            A
02  INFO ONLY,ENGINE FAILURE           BX              BX             FAAAAAAAAA
02 COM/NAV IDENT                       C                               AAAAAAAAA
02 COMMUNICATION                       CA              C       F       001111120
02 EXTERNAL COMM ATTN                  CAA             CA              111111111
02 REDUNDANCY ATTN                     CAB             CAA             111111111
02 SECURE VOICE                        CAD             CAA             000000000
02  CODER UNIT                 69AA1   CADA            CAD           A
02  MOUNT CODER                69AB1   CADB            CAD           0
02  CONTROL UNIT               69AC1   CADC            CAD           A
02  RELAY                      69AD1   CADD            CAD           A
02  CIRCUIT BREAKER            42FCD   CADE            CAD           8
02 UHF-AM COMM                         CAE             CAB             111111111
02   RECEIVER-TRANSMITTER      63AA1   CAEA            CAE           8
02   CHASSIS ASSY              63AAA   CAEB            CAE           8
02   PREAMP-RF                 63AAB   CAEC            CAE           8
02   AMPLIFIER-IF              63AAC   CAED            CAE           8
02   AMPLIFIER-IF              63AAD   CAEE            CAE           8
02   MODULATOR-AUDIO AMP       63AAE   CAEF            CAE           8
02   SPECTRUM GENERATOR        63AAF   CAEG            CAE           8
02   POWER AMPLIFIER XMITTR    63AAG   CAEH            CAE           3
02   RECEIVER-GUARD            63AAH   CAEJ            CAE           1
02   PWR SUPPLY                63AAJ   CAEK            CAE           8
02   MECHANICAL TUNER          63AAK   CAEL            CAE           8
02  INDICATOR SWR              63AB1   CAEM            CAE           0
02  BLOWER EXTERNAL            63AC1   CAEN            CAE           A
02  MOUNT-R/T                  63AD1   CAEP            CAE           0
02  CONTROL UNIT               63AF1   CAEQ            CAE           8
02  ANTENNA                    63AF1   CAER            CAF           8
02  ANTENNA                    63AF1   CAER            CAG           8
02  FILTER-POWER               63AG1   CAES            CAE           7
02  CIRCUIT BREAKER            42FCD   CAET            CAE           8
02 VHF-FM COMM                         CAF             CAB             111111111
02 VHF-FM COMM                         CAF             CCK             AAAAAAAAA
02  RECEIVER-TRANSMITTER       62AA1   CAFA            CAF           8
02  CHASSIS ASSY               62AAA   CAFB            CAF           8
02  MODULATION AMP,XMITTER     62AAB   CAFC            CAF           3
02  AUDIO AMP                  62AAC   CAFD            CAF           8
02  IF AMP                     62AAE   CAFE            CAF           8
02  RF OSCILLATOR              62AAF   CAFF            CAF           8
02  ANTENUATOR VARIABLE        62AAG   CAFG            CAF           8
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02	PWR SUPPLY			62AAH	CAFH	CAF	8	
02	CONTROL UNIT-RF			62AAJ	CAFJ	CAF	8	
02	RF AMP %A6500<			62AAK	CAFK	CAF	8	
02	RF AMP %A6600<			62AAL	CAFL	CAF	8	
02	OSCILLATOR BUFFER			62AAM	CAFM	CAF	8	
02	VHF-TUNER			62AAN	CAFN	CAF	8	
02	XTAL REF			62AAP	CAFP	CAF	8	
02	GEAR BOX			62AAQ	CAFQ	CAF	A	
02	VOLTAGE REG			62AAR	CAFR	CAF	8	
02	MOUNT R/T UNIT			62AP1	CAFS	CAF	0	
02	CONTROL UNIT			62AC1	CAFT	CAF	8	
02	SPIKE ANT			62AD1	CAFU	CAF	8	
02	COUPLER ANT			62AE1	CAFV	CAF	8	
02	FILTER-DC PWR			62AG1	CAFW	CAF	7	
02	CIRCUIT BREAKER			42FCD	CAFX	CAF	8	
02	VHF-AM COMM				CAG	CAB		111111111
02	RECEIVER/TRANSMITTER			62BA1	CAGA	CAG	8	
02	CHASSIS ASSY			62BAA	CAGB	CAG	8	
02	RECEIVER ASSY			62BAB	CAGC	CAG	8	
02	EXCITER AMP, XMITTER			62BAC	CAGD	CAG	3	
02	PWR SUPPLY			62BAD	CAGE	CAG	8	
02	PWR CONTROL-SIDETONE			62BAE	CAGF	CAG	8	
02	MODULATOR			62BAF	CAGG	CAG	3	
02	RF AMP			62BAG	CAGH	CAG	8	
02	MOUNT R/T			62BB1	CAGJ	CAG	0	
02	CONTROL UNIT			62BC1	CAGK	CAG	8	
02	POTENTIOMETER-SQUELCH			42FCG	CAGL	CAG	5	
02	CIRCUIT BREAKER			42FCD	CAGM	CAG	8	
02	COM/ICS				CAH	CAA		AAAAAAAAA
02	TRANSMIT CONTROL				CAJ	CAH		333333333
02A	MIC AMP	2 EA	64ABB	64AAB	CAJA	CAJ	1	
02B	MIC AMP		64ABB	64AAB	CAJA	CAJ	8	
02A	MIC AMP	2 EA	64AAB	64ABB	CAJB	CAJ	1	
02B	MIC AMP		64AAB	64ABB	CAJB	CAJ	8	
02A	TALK BUTTON,CONT WHEEL			64AF1	CAJC	CAJ	1	
02B	TALK BUTTON,CONT WHEEL			64AF1	CAJC	CAJ	A	
02A	FOOT SWITCH			64AG1	CAJD	CAJ	0	
02A	CORDAGE,HEADSET PILOT			64AD1	CAJE	CAJ	1	
02B	CORDAGE,HEADSET PILOT			64AD1	CAJE	CAJ	A	
02A	CORDAGE HEADSET COPILOT			64AE1	CAJF	CAJ	1	
02B	CORDAGE HEADSET COPILOT			64AE1	CAJF	CAJ	0	
02	RECEIVER CONTROL				CAK	CAH		777777777
02	RECEIVER CONTROL				CAK	CAM		AAAAAAAAA
02A	HEADSET AMP	2 EA	64ABC	64AAC	CAKA	CAK	1	
02B	HEADSET AMP		64ABC	64AAC	CAKA	CAK	8	
02A	HEADSET AMP	2 EA	64AAC	64ABC	CAKB	CAK	1	
02B	HEADSET AMP		64AAC	64ABC	CAKB	CAK	8	
02	AUDIO POCESSING				CAL	CAH		AAAAAAAAA
02	AUDIO POCESSING				CAL	CAM		AAAAAAAAA
02A	CONTROL AIC-18	2 EA	64AB1	64AA1	CALA	CAL	1	

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02B	CONTROL AIC-18	64AB1	64AA1	CALA	CAL	8
02A	CONTROL AIC-25 2EA	64AA1	64AB1	CALB	CAL	1
02B	CONTROL AIC-25	64AA1	64AB1	CALB	CAL	8
02A	CHASSIS ASSY 2EA	64ABA	64AAA	CALC	CAL	1
02B	CHASSIS ASSY	64ABA	64AAA	CALC	CAL	8
02A	CHASSIS ASSY 2EA	64AAA	64ABA	CALD	CAL	1
02B	CHASSIS ASSY	64AAA	64ABA	CALD	CAL	8
02	TERM BLOCK		64AC1	CALE	CAL	0
02	RESISTORS		42FBF	CALF	CAL	1
02	CIRCUIT BREAKER		42FAB	CALG	CAL	A
02	NAV/ICS CONTROL			CAM	CCD	F111111111
02	NAV/ICS CONTROL			CAM	CCM	AAAAAAAAA
02	IDENTIFICATION			CB	C	000000000
02A	IFF			CBA	CB	888888888
02B	IFF			CBA	CB	AAAAAAAAA
02	R/T APX-64	65AC1	65AA1	CBAA	CBA	8
02	R/T APX-72	65AA1	65AC1	CBAB	CBA	8
02	CHASSIS ASSY	65ACA	65AAA	CBAC	CBA	8
02	CHASSIS ASSY	65AAA	65ACA	CBAD	CBA	8
02	RF MODULE	65ACB	65AAB	CBAE	CBA	8
02	RF MODULE	65AAB	65ACB	CBAF	CBA	8
02	IF MODULE		65AAC	CBAG	CBA	8
02	DECODER MODULE		65AAD	CBAH	CBA	8
02	DELAY LINE MODULE		65AAE	CBAJ	CBA	8
02	CODER MODULE		65AAF	CBAK	CBA	8
02	REF SIG GEN MODULE		65AAG	CBAL	CBA	8
02	POWER SUPPLY MODULE		65AAJ	CBAM	CBA	8
02	TEST MODULE		65AAK	CBAN	CBA	0
02	MOUNT R/T APX-64		65AB1	CBAP	CBA	0
02	MODULATOR		65ACC	CBAQ	CBA	8
02	DETECTOR		65ACD	CBAR	CBA	8
02	PRINTED CRKT CASE		65ACE	CBAS	CBA	8
02	ENCODER CONT.		65ACF	CBAT	CBA	8
02	ENCODER CLOCK		65ACG	CBAU	CBA	8
02	DECODER		65ACH	CBAV	CBA	8
02	PWR SUPPLY		65ACJ	CBAW	CBA	8
02	ENCODER GATING		65ACK	CBAX	CBA	8
02	MODE 4 MODULE		65ACL	CBAZ	CBA	8
02	PROCESSOR		65ACM	CBAZA	CBA	8
02	XMTTR MODULE		65ACN	CBAZB	CBA	8
02	RCVR MODULE		65ACP	CBAZC	CBA	8
02	DELAY LINE		65ACQ	CBAZD	CBA	8
02	MOUNT R/T APX-72		65AD1	CBAZE	CBA	0
02	CONTROL UNIT		65AE1	CBAZF	CBA	8
02	TEST SET XPNDR		65AF1	CBAZG	CBA	0
02	SIG GEN : REC		65AFA	CBAZH	CBA	0
02	EVALUATOR		65AFB	CBAZJ	CBA	8
02	TIMMING ASSY		65AFC	CBAZK	CBA	8
02	DIRECTIONAL CPLR		65AFD	CBAZL	CBA	8
02	REGULATOR ASSY		65AFE	CBAZM	CBA	8

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02	CRKT CARD ASSY	65AFF	CBAZN	CBA		8	
02	MOUNT TEST SET	65AG1	CBAZP	CBA		0	
02	ANTENNA 2EACH	65AH1	CBAZQ	CBA		2	
02	SW UNIT ANTENNA	65AM1	CBAZR	CBA		2	
02	UHF HOLD RELAY%UNKNK	65AN1	CBAZS	CBA		0	
02	SW ANTENNA SEL	65AP1	CBAZT	CBA		2	
02	IFF CAUTION LITE	65AQ1	CBAZU	CBA		0	
02	CRYPTO COMPUTER	65BA1	CBAZV	CBA		1	
02	MOUNT CRYPTO	65BB1	CBAZW	CBA		0	
02	CONNECTOR	65BBA	CBAZX	CBA		1	
02	WIRING	65BC1	CBAZY	CBA		1	
02	CIRCUIT BREAKER 2 EA	42FCD	CBAZZ	CBA		8	
02	TRANSMITTER MODULE	65AAH	CBAZZA	CBA		8	
02A	RADAR BEACON		CBB	CB			333333333
02A	RECEIVER/XMTTR	72AA1	CBBA	CBB		8	
02A	RF MODULE	72AAA	CBBB	CBB		8	
02A	IF AMP	72AAB	CBBC	CBB		8	
02A	ENCODER/DECODER	72AAC	CBBD	CBB		8	
02A	MODULATOR	72AAD	CBBE	CBB		8	
02A	PWR SUPPLY	72AAE	CBBF	CBB		8	
02A	ANT ASSY	72AB1	CBBG	CBB		8	
02A	CIRCUIT BREAKER	42FCD	CBBH	CBB		3	
02	NAVIGATION		CC	C	F		001111110
02	CLOCK	51BAK	CCAA	CC		0	
02	HOUR METER	51BAL	CCAB	CC		0	
02	NAV. AIDS REDUN. ATTEN.		CCB	CC			111111111
02	TACAN INFO		CCD	CCB			111111111
02	REC/XMTTR	71BA1	CCDA	CCD		8	
02	CHASSIS ASSY	71BAA	CCDB	CCD		8	
02	RF MODULE	71BAB	CCDC	CCD		8	
02	ANT SEL MODULE	71BAM	CCDD	CCD		2	
02	PWR SUPPLY	71BAP	CCDE	CCD		8	
02	MOUNT R/T	71BB1	CCDF	CCD		0	
02	CONTROL UNIT	71BC1	CCDG	CCD		8	
02	ANTENNA 2 EA	71BE1	CCDH	CCD		2	
02	FAN COOLING	71BJ1	CCDJ	CCD		A	
02	CAPACITOR	42FCF	CCDK	CCD		8	
02	CIRCUIT BREAKER 2 EA	42FCD	CCDL	CCD		8	
02	SWITCH-ANTENNA-UPR &LWR	71BD1	CCDM	CCD		8	
02	CABLES & CONNECTORS	71BF1	CCDN	CCD		5	
02	TACAN RANGE		CCE	CCD			222222242
02	RANGE DECODER	71BAC	CCEA	CCE		8	
02	RANGE A MODULE	71BAD	CCEB	CCE		8	
02	RANGE B MODULE	71BAE	CCEC	CCE		8	
02	RANGE MECH MODULE	71BAF	CCED	CCE		3	
02	AIR TO AIR MODULE	71BAN	CCEE	CCE		1	
02	BDHI DISPLAY		CCF	CCE			AAAAAAAAA
02	BDHI INDICATOR	71BG1	CCFA	CCF		A	
02	TACAN BEARING		CCG	CCD			9999999A9
02	BEARING DECODER	71BAG	CCGA	CCG		8	

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02   BEARING A MODULE           71BAH   CCGB             CCG        8
02   BEARING B MODULE           71BAJ   CCGC             CCG        8
02   BEARING MECH MODULE        71BAK   CCGD             CCG        8
02   MAG PHASE DET AMP          71BAL   CCGE             CCG        8
02  BDHI DISPLAY                        CCH              CCG            111111111
02   BDHI INDICATOR             71BG1   CCHA             CCH        A
02  COURSE INDICATOR DISPLAY            CCJ              CCH   K CCH  S333333333
02  COURSE INDICATOR DISPLAY            CCJ              CCG          F111111111
02  COURSE INDICATOR DISPLAY            CCJ              CCK          FAAAAAAAAA
02   COURSE INDICATOR           71BH1   CCJA             CCJ        A
02   CAPACITOR VERTICAL NEEDLE  42FBG   CCJB             CCJ        8
02  VHF/FM BEARING                      CCK              CCB            111111101
02   VHF HOMING MODULE          62AAD   CCKA             CCK        8
02   ANTENNA HOMING             62AF1   CCKB             CCK        8
02   SWITCH BEARING SEL         9962A   CCKC             CCK        5
02  LF/ADF BEARING                      CCM              CCB            111111111
02  SIGNAL PROCESSING                   CCN              CCM            AAAAAAAAA
02   RECVR                      71AA1   CCNA             CCN        8
02   CHASSIS ASSY               71AAA   CCNB             CCN        8
02   FIRST RF AMP               71AAB   CCNC             CCN        8
02   MODULATOR                  71AAC   CCND             CCN        8
02   RF AMP                     71AAD   CCNE             CCN        8
02   IF AMP                     71AAE   CCNF             CCN        8
02   AUDIO AMP                  71AAF   CCNG             CCN        8
02   MIXER                      71AAG   CCNH             CCN        8
02   LOCAL OSC                  71AAH   CCNJ             CCN        8
02   BF OSC                     71AAJ   CCNK             CCN        1
02   PWR SUPPLY                 71AAK   CCNL             CCN        8
02   MOTOR GEAR CASE            71AAL   CCNM             CCN        8
02   RCVR MOUNT                 71AB1   CCNN             CCN        0
02   PWR INVERTER               71ABA   CCNP             CCN        8
02   CONTROL UNIT               71AC1   CCNQ             CCN        8
02   LOOP ANTENNA               71AD1   CCNR             CCN        8
02   COMPENSATOR                71ADA   CCNS             CCN        2
02   SENSE ANTENNA              71AE1   CCNT             CCN        8
02   FILTER                     71AJ1   CCNU             CCN        4
02   CIRCUIT BREAKER            42FCD   CCNV             CCN        8
02  BDHI DISPLAY                        CCP              CCM            AAAAAAAAA
02   BDHI INDICATOR             71BG1   CCPA             CCP        A
02  GYRO COMPASS INFO                   CCQ              CCV     CCW    111111111
02  COMPASS SIG PROCESS                 CCR              CCQ            AAAAAAAAA
02A  DIR GYRO ASSY              51BB1   CCRA             CCR        8
02A  DIR GYRO                   51BBA   CCRB             CCR        8
02A  PWR SUP-AMP                51BBB   CCRC             CCR        8
02A  ELECT CONT AMP             51BBC   CCRD             CCR        8
02A  MAG DET                    51BBD   CCRE             CCR        A
02A  COMPENSATOR                51BBE   CCRF             CCR        2
02A  ANNUNCIATOR   %UKN<        51BBF   CCRG             CCR        0
02   MAG FLUX DET               51BAC   CCRH             CCR        A
02   SLAVING IND                51BAH   CCRJ             CCR        0
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02B DIRECTIONAL IND VAC %GYRO< 51BAG   CCRK          CCR           8
02A DIRECTIONAL IND %GYRO<     51EAD   CCRL          CCR           8
02 COMPASS DISPLAY                     CCS           CCQ             AAAAAAAAA
02ABDHI DISPLAY                        CCT           CCS             AAAAAAAAA
02BBDHI DISPLAY                        CCT           CCS             111111111
02   BDHI INDICATOR            71BG1   CCTA          CCT           8
02BHEADING IND DISPLAY                 CCU           CCS             111111111
02B DIR IND                    51BAG   CCUA          CCU           A
02 HEADING                             CCV           CC              00100011C
02 STANDBY HEADING                     CCW           CCV     K CCQ   AAAAAAAAA
02   STANDBY COMPASS           51BAJ   CCWA          CCW           8
02   INFORMATION AND DISPLAY           D                             AAAAAAAAA
02   FLIGHT STATUS                     DA            D               011111130
02   OUTSIDE AIRTEMP                   DB            DA              000000000
02    OAT INDICATOR            51EAC   DBA           DB            8
02   ALTITUDE INDICATION               DC            DA      E       00A111AA0
02   BAROMETRIC ALTITUDE               DD            CBA             111111111
02   BAROMETRIC ALTITUDE               DD            DC              AAAAAAAAA
02    ALTIMETER          51CAK 51CAB   DDA           DD            8
02    ALTIMETER AAU-21   51CAB 51CAK   DDB           DD            8
02   VERTICAL VELOCITY INDICATIO       DE            DC              000000000
02    VERT VELOCITY INDICATOR  51CAA   DEA           DE            8
02   ATTENUATION                       DF            DA              111111111
02A G-LOAD INDICATION                  DG            DF              000010000
02A  ACCELEROMETER             51CAG   DGA           DG            8
02   AIRSPEED INDICATION               DH            DF              051010150
02    AIRSPEED INDICATOR       51BAA   DHA           DH            8
02   STATIC  SOURCE                    DJ            DC             SAAAAAAAAA
02   STATIC  SOURCE                    DJ            DD             FAAAAAAAAA
02   STATIC  SOURCE                    DJ            DE             FAAAAAAAAA
02   STATIC  SOURCE                    DJ            DH              AAAAAAAAA
02    VALVE  SOURCE SELECT     51DAB   DJA           DJ            0
02    BUTTON STATIC SOURCE %2FA<51DAD  DJB           DJ            1
02   PITOT SENSE                       DK            DH              AAAAAAAAA
02    PITOT TUBE               51DAA   DKA           DK            8
02   PITOT HEAT                        DL            DK      A       AAAAAAAAA
02   PITOT HEAT                        DL            DV      A       AAAAAAAAA
02    SWITCH PITOT/STALL HEAT  51DAF   DLA           DL            A
02    CKT BKR                  42FAB   DLB           DL            A
02   ATTITUDE                          DM            DA      E       012111A10
02   PITCH/ROLL INDICATION             DN            DM         DP   111111111
02A  ATT IND ELECTRIC          51CAE   DNA           DN            8
02B  ATT IND VACUUM            51CAF   DNA           DN            8
02   TURN/SLIP INDICATION              DP            DM      K DN    AAAAAAAAA
02     INDICATOR               51CAC   DPA           DP            8
02A ELECTRIC DRIVE                     DQ            DN              AAAAAAAAA
02A  CKT BKR                   42FAB   DQA           DQ            A
02B VACUUM DRIVE                       DR            CCR             AAAAAAAAA
02B VACUUM DRIVE                       DR            DN              AAAAAAAAA
02B  GAGE SUCTION              51AAA   DRA           DR            0
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028  FILTER VACUUM              51AAC  DRB            DR             1
028  MANIFOLD                   51AAG  DRC            DR             1
028 FRONT VACUUM SOURCE                LDS            DR       KRDS    AAAAAAAA
028 REAR  VACUUM SOURCE                RDS            DR       KLDS    AAAAAAAA
028  VACUUM PUMP                51AAD  LDSA          LDS             A
028  VACUUM PUMP                51AAC  RDSA          RDS             A
028  RELIEF VALVE               51AAF  LDSB          LDS             1
028  RELIEF VALVE               51AAE  RDSB          RDS             1
028  CHECK VALVE                51AAF  LDSC          LDS             1
028  CHECK VALVE                51AAF  RDSC          PDS             1
028  OIL SEPERATOR              51AAB  LDSD          LDS             1
028  OIL SEPERATOR              51AAB  RDSD          RDS             1
02  WARNINGS                           DT             D                AAAAAAAAA
02  ENGINE FIRE WARNING                DU             DT       X       AAAAAAAAA
02   DETECTORS  4 EA            49BAA  DUA            DU             1
02   WIRING                     49BAC  DUB            DU             A
02   FIRE DET WARN LIGHT        9949A  DUC            DU             A
02  STALL WARNING                      DV             DT               000000000
02   DUAL WARN UNIT             51EAA  DVA            DV             8
02   DUAL WARNING UNIT          51EAA  DVA            NU             1
02   ACTUATOR STALL WARN        51EAB  DVB            DV             A
02   TRANSISTOR                 42FBC  DVC            DV             A
02   AMP ASSY  AURAL WARN       42FBD  DVD            DV             8
02   AMPLIFIER ASSY AURAL WNG   42FBD  DVD            NU             1
02   DIODE                      42FBE  DVE            DV             A
02   CKT BKR                    42FAB  DVF            DV             A
02  ENVIRONMENTAL CONTROL              E                               AAAAAAAAA
02  LIGHTING                           EA             F        D       111111121
02  INTERNAL LIGHTING                  EAA            EA               011111110
02  NORMAL LIGHTING                    EAB            EAA         EAF  111111111
02  FLIGHT INSTRUMENTS                 EAC            EAB              222222222
02   INSTRUMENT LIGHT SYSTEM    44AD1  EACA           EAC            1
02   RHEOSTAT                   44AE1  EACB           EAC            5
02   CKT BKR                    42FAB  EACC           EAC            A
02  ENGINE INSTRUMENTS                 EAD            EAB              111111111
02   INST LIGHT SYS             44AD1  EADA           EAD            1
02   RHEOSTAT                   44AE1  EADB           EAD            5
02   CKT BKR                    42FAB  EADC           EAD            A
02   CKT BKR                    42FAB  EADC           EAE            A
02  SWITCH/CONTROL PANEL               EAE            EAB              000000000
02   INTERIOR LIGHT SYSTEM      44AC1  EAEA           EAE            1
02   RHEOSTAT                   44AE1  EAEB           EAF            5
02  BACKUP LIGHTING                    EAF            EAA      K EAB   AAAAAAAAA
02  DOME LIGHTING                      EAG            EAF              111111111
02   INTERIOR LIGHT SYSTEM      44AC1  EAGA           EAG            1
02   CKT BKR                    42FAB  EAGB           EAG            A
02A  CKT BKR                    42FAB  EAGB           EAH            A
02  UTILITY/MAP                        EAH            EAF              111111111
02A  INTERIOR LIGHT SYS 2 EA    44AC1  EAHA           EAH            1
028  INTERIOR LIGHT SYSTEM      44AC1  EAHA           EAH            A
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02B  RHEOSTAT                       44AE1   EAHC              EAH          5
02B  RHEOSTAT                       44AE1   EAHC              EAJ          5
02B INSTRUMENT FLOOD                        EAJ               EAF              111111111
02B   INTERIOR LIGHT SYSTEM         44AC1   EAJA              EAJ          1
02B   CKT BKR                       42FAB   EAJB              EAH          A
02B   CKT BKR                       42FAB   EAJB              EAJ          A
02  EXTERNAL LIGHTING                       EAK               EA               111111111
02  ATTENUATION                             EAL               EAK              111111111
02  ANTI COLLISION                          EAM               EAL              000000000
02    ANTI COLLISION LIGHT          44AAA   EAMA              EAM          A
02    CKT BKR                       42FAB   EAMB              EAM          A
02  LANDING                                 EAN               EAL              000000010
02    LANDING LIGHT SYSTEM %2FA<44AB1   EANA              EAN          1
02    CKT BKR                       42FAB   EANC              EAN          A
02  TAXI                                    EAP               EAL              000000000
02    LAND LIGHT SYS%TAXI< 2 EA 44AB1   EAPA              EAP          5
02    CKT BKR                       42FAB   EAPC              EAP          A
02  NAVIGATION                              EAQ               EAL              000000000
02    NAV LIGHT SYS                 44AA1   EAQA              EAQ          2
02    CKT BKR                       42FAB   EAQB              EAQ          A
02  CABIN ENVIRONMENT                       EB                E                111111111
02  WINSHIELD CLEAR                         EBA               EB       Y       010000030
02    DEFROSTER CONTROL             41DAC   EBAA              EBA          A
02  PILOTS DEFROST                         LEBB               EBA     KREBB    AAAAAAAAA
02  COPILOTS DEFROST                       REBB               EBA     KLEBB    AAAAAAAAA
02    VALVE                         41CAA  LEBBA             LEBB          3
02    VALVE                         41CAA  REBBA             REBB          3
02    DUCT                          41CAB  LEBBB             LEBB          1
02    DUCT                          41CAB  REBBB             REBB          1
02    OUTLET UNION                  41CAC  LEBBC             LEBB          1
02    OUTLET UNION                  41CAC  REBBC             REBB          1
02  CABIN HEATED                            EBC               EB               000000000
02  PILOT AIR MIXING                       LEBD              LEBB              AAAAAAAAA
02  PILOT AIR MIXING                       LEBD               EBC              111111111
02  COPILOT AIR MIXING                     REBD              REBB              AAAAAAAAA
02  COPILOT AIR MIXING                     REBD               EBC              111111111
02    AIRBOX                        41AAA  LEBDA             LEBD          1
02    AIRBOX                        41AAA  REBDA             REBD          1
02    BAFFLE                        41AAB  LEBDB             LEBD          1
02    BAFFLE                        41AAB  REBDB             REBD          1
02    VALVE                         41AAC  LEBDC             LEBD          8
02    VALVE                         41AAC  REBDC             REBD          8
02    VENT BOX                      41AAD  LEBDD             LEBD          1
02    VENT BOX                      41AAD  REBDD             REBD          1
02    AIR DUCT                      41AAE  LEBDE             LEBD          1
02    AIR DUCT                      41AAE  REBDE             REBD          1
02    CABIN HEAT CONTROL            41DAB  LEBDF             LEBD          8
02    CABIN HEAT CONTROL            41DAB  REBDF             REBD          8
02    EXHAUST MUFFLER               21NAD  LEBDG             LEBD          8
02    EXHAUST MUFFLER               21NAD  REBDG             REBD          8
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02    SHROUD                        21NAE  LEBDH            LEBD           1
02    SHROUD                        21NAE  REBDH            REBD           1
02   CABIN HEAT                     41DAA  LEBDJ            LEBD           8
02   CABIN HEAT                     41DAA  REBDJ            REBD           8
02   VENTILATION                            FBE             EB              000000000
02    VENT-AIR 2 EA                 41BAA   EBEA            EBE            2
02    ADAPTER                       41BAB   EBEB            EBE            1
02    CONTROL CABIN AIR 2 EA        41DAB   EBEC            EBE            5
02    AIR SCOOP                     41BAC   EBED            EBE            1
02B   PLENUM                        41BAD   EBEE            EBE            1
02    SHUTOFF VALVE                 41BAE   EBEF            EBE            1
02   INLET ASSY   2EA               41BAF   EBEG            EBE            3
02    DUCT 2 EA                     41BAG   EBEH            EBE            1
02   CABIN HEAT                     41DAA   EBEJ            EBE            5
02   FLIGHT CONTROL                         F                               AAAAAAAAA
02   LIFT AUGMENTATION                      FA              F        C      010000030
02   FLAPS POSITIONED                       FAA             FA              AAAAAAAAA
02   LEFT FLAPS POSITIONED                 LFAB             FAA             AAAAAAAAA
02   RIGHT FLAPS POSITIONED                RFAB             FAA             AAAAAAAAA
02   RIGHT FLAPS POSITIONED                RFAB             FCH            FAAAAAAAAA
02    CABLE                         14DAK  LFABA           LFAB            A
02    CABLE                         14DAK  RFABA           RFAB            A
02    PULLEYS                       14DAL  LFABB           LFAB            8
02    PULLEYS                       14DAL  RFABB           RFAB            8
02    QUADRANT AND BELLCRANK        14DAR  LFABC           LFAB            7
02    QUADRANT AND BELLCRANK        14DAR  RFABC           RFAB            7
02    BELLCRANK                     14DAS  LFABD           LFAB            3
02    BELLCRANK                     14DAS  RFABD           RFAB            3
02   OUTBOARD FLAPS POSITIONED             LFAC            LFAB             666666666
02   OUTBOARD FLAPS POSITIONED             RFAC            RFAB             666666666
02    FLAP,OUTBD                    14DAB  LFACA           LFAC            3
02    FLAP,OUTBD                    14DAB  RFACA           RFAC            3
02    LINKS 2 EA                    14DAM  LFACB           LFAC            5
02    LINKS 2 EA                    14DAM  RFACB           RFAC            5
02    ROD                           14DAT  LFACC           LFAC            5
02    ROD                           14DAT  RFACC           RFAC            5
02    PANEL FLAP GAP                14DAC  LFACD           LFAC            0
02    PANEL FLAP GAP                14DAC  RFACD           RFAC            0
02   INBOARD FLAPS POSITIONED              LFAD            LFAB             444444444
02   INBOARD FLAPS POSITIONED              RFAD            RFAB             444444444
02    FLAP INBOARD                  14DAA  LFADA           LFAD            3
02    FLAP INBOARD                  14DAA  RFADA           RFAD            3
02    LINK                          14DAM  LFADB           LFAD            A
02    LINK                          14DAM  RFADB           RFAD            A
02    PANEL FLAP GAP                14DAC  LFADC           LFAD            0
02    PANEL FLAP GAP                14DAC  RFADC           RFAD            0
02   FLAP DRIVE                             FAE             FA              AAAAAAAAA
02    FLAP MOTOR                    14DAN   FAEA            FAE            A
02    ACTUATOR                      14DAQ   FAEB            FAE            8
02    CKT BKR                       42FAB   FAEC            FAE            A
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02	FLAP CONTROL		FAF	FAE		AAAAAAAAA
02	CONTROL LEVER	14DAD	FAFA	FAF		8
02	SWITCH FLAP OPERATING	14DAE	FAFB	FAF		7
02	CONTROL FOLLOW UP	14DAG	FAFC	FAF		1
02	POINTER POSITION	14DAF	FAFD	FAF		0
02	LIMIT SWITCHES 2 EA	14DAH	FAFE	FAF		3
02	YAW CONTROL		FB	F		0AAAAAAA0
02	RUDDERS POSITIONED		FBA	FB		010000030
02	LEFT RUDDER POSITIONED		LFBB	FBA		222222222
02	LEFT RUDDER POSITIONED		LFBB	FBA	KRFBB	AAAAAAAAA
02	RIGHT RUDDER POSITIONED		RFBB	FBA		222222222
02	RIGHT RUDDER POSITIONED		RFBB	FBA	KLFBB	AAAAAAAAA
02	RUDDER ASSY	14CAE	LFBBA	LFBB		3
02	RUDDER ASSY	14CAF	RFBBA	RFBB		3
02	BALANCE WEIGHT	14CAF	LFBBB	LFBB		0
02	BALANCE WEIGHT	14CAF	RFBBB	RFBB		0
02	RUDDER HINGE ASSY	11GBB	LFBBC	LFBB		2
02	RUDDER HINGE ASSY	11GBB	RFBBC	RFBB		2
02	RUDDER CONTROL		FBC	FBA		AAAAAAAAA
02	BELLCRANK	14CAB	FBCA	FBC		A
02	RUDDER BAR LINK ROD ASSY	14CAD	FBCB	FBC		A
02	CABLES	14CCA	FBCC	FBC		A
02	PULLEY	14CCB	FBCD	FBC		8
02	BELLCRANK 2 EA	14CCD	FBCE	FBC		7
02	RUDDER PEDAL CONTROL		FBD	FBC		091111190
02	PEDAL SUPPORT 2 EA	14CAC	FBDA	FBD		1
02	RUDDER PEDAL 2 EA	14CAA	FBDB	FBD		1
02	TRIM CONTROL		FBE	FBC		111111111
02	WHEEL ASSY	14CDA	FBEA	FBE		8
02	TRIM INDICATOR	14CDB	FBEB	FBE		0
02	CHAIN	14CDD	FBEC	FBE		A
02	SPROCKET	14CDE	FBED	FBE		A
02	ACTUATOR	14CDH	FBEE	FBE		7
02	BUNGEE	13CAA	FBEF	FBE		7
02	PITCH CONTROL		FC	F		0AAAAAAA0
02	ELEVATOR POSITIONED		FCA	FC		AAAAAAAAA
02	ELEVATOR	14BAA	FCAA	FCA		3
02	ARM AND BALANCE WEIGHT	14BAB	FCAB	FCA		0
02	ELEVATOR HINGE ASSY	11GAB	FCAC	FCA		3
02	ELEVATOR DRIVE/CONTROL		FCB	FCA		031111190
02	CABLE	14BBA	FCBA	FCB		A
02	PULLEY	14BBB	FCBB	FCB		8
02	BELLCRANK	14BBC	FCBC	FCB		A
02	ROD	14BBD	FCBD	FCB		A
02	PILOT CONTROL		FCC	FCB	K FCD	AAAAAAAAA
02	CONTROL WHEEL	14FAA	FCCA	FCC		1
02	BEARING	14FAB	FCCB	FCC		6
02	CONTROL COLUMN ASSY	14FAC	FCCC	FCC		A
02B	BOB WEIGHT	14FAF	FCCD	FCC		0
02	COPILOT CONTROL		FCD	FCB	K FCC	AAAAAAAAA

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02    CONTROL WHEEL               14FAA   FCDA              FCD          1
02    BEARING                     14FAB   FCDB              FCD          6
02    CONTROL COLUMN ASSY         14FAC   FCDC              FCD          A
02B   BOB WEIGHT                  14FAF   FCDD              FCD          0
02   TRIM TAB POSITIONED                  FCE               FCA    K FCB       AAAAAAAAA
02    TRIM TAB                    14BAC   FCEA              FCE          1
02    INDICATOR                   14BCB   FCEB              FCE          0
02    TRIM ACTUATOR               14BCH   FCEC              FCE          A
02    STOP BLOCK                  14BCL   FCED              FCE          1
02    CHAIN                       14BCD   FCEE              FCE          A
02    PULLEY                      14BCG   FCEF              FCE          3
02    CABLE                       14BCE   FCEG              FCE          A
02A  MANUAL TRIM                          FCF               FCE       FCG      111111111
02B  MANUAL TRIM                          FCF               FCF                AAAAAAAAA
02    TRIM CONTROL WHEEL          14BCA   FCFA              FCF          3
02    SPROCKET                    14BCC   FCFB              FCF          8
02A  ELECTRIC TRIM                        FCG               FCF       FCF      111111111
02A   SWITCH ELECTRIC TRIM        14BCJ   FCGA              FCG          A
02A   ELECTRIC TRIM DRIVE         14BCK   FCGB              FCG          A
02A   CIRCUIT BREAKER             42FAB   FCGC              FCG          A
02   FLAPS/ELEVATOR INTERCONNECT          FCH               FCF                000000010
02    INTECONNECT CABLE ASSY      14DAU   FCHA              FCH          A
02   ROLL CONTROL                         FD                F                  0AAAAAAA0
02   AILERONS POSITIONED                  FDA               FD                 AAAAAAAAA
02   LEFT AILERON POSITIONED             LFDB               FDA                222222222
02   LEFT AILERON POSITIONED             LFDB               FDA    KRFDB       AAAAAAAAA
02   RIGHT AILERON POSITIONED            RFDB               FDA                222222222
02   RIGHT AILERON POSITIONED            RFDB               FDA    KLFDB       AAAAAAAAA
02    AILERON                     14AAA  LFDBA             LFDB          3
02    AILERON                     14AAA  RFDBA             RFDB          3
02    BALANCE WEIGHT              14AAB  LFDBB             LFDB          0
02    BALANCE WEIGHT              14AAB  RFDBB             RFDB          0
02    TRIM TAB                    14AAC  LFDBC             LFDB          0
02    TRIM TAB                    14AAC  RFDBC             RFDB          0
02    ROD                         14AAG  LFDBD             LFDB          A
02    ROD                         14AAG  RFDBD             RFDB          A
02   AILERON CONTROL                      FDC               FDA                AAAAAAAAA
02    PULLEY                      14AAE   FDCA              FDC          8
02    BELLCRANK 2 EA              14AAF   FDCB              FDC          7
02    CABLE                       14AAH   FDCC              FDC          A
02   PILOT CONTROL                        FDD               FDC    K FDE       AAAAAAAAA
02    CONTROL WHEEL               14FAA   FDDA              FDD          1
02    BEARING                     14FAB   FDDB              FDD          6
02    CONTROL COLUMN ASSY         14FAC   FDDC              FDD          A
02   COPILOT CONTROL                      FDE               FDC    K FDD       AAAAAAAAA
02    CONTROL WHEEL               14FAA   FDEA              FDE          1
02    BEARING                     14FAB   FDEB              FDE          6
02    CONTROL COLUMN ASSY         14FAC   FDEC              FDE          A
02   GROUND CONTROL                       G                                    AAAAAAAAA
02   SPEED CONTROL                        GA                G      C           000000000A0
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02  SPEED CONTROL                      GA               GAX            500000005
02  ATTENUATION                        GAX              G              111111111
02  DIRECTIONAL CONTROL                GB               G              110000011
02  WHEEL BRAKES                       GC               GA             AAAAAAAAA
02  WHEEL BRAKES                       GC               GB      K GG   AAAAAAAAA
02   MASTER CYLINDER   2 EACH  13FAD   GCA              GC           8
02   WHEEL CYLINDER   2 SETS   13FAE   GCB              GC           8
02   PRESSURE PLATE   2 SETS   13FAG   GCC              GC           1
02   BACK PLATE       2 SETS   13FAH   GCD              GC           1
02   LINING           2 SETS   13FAJ   GCE              GC           1
02   TORQUE PLATE     2 SETS   13FAK   GCF              GC           A
02   DISC             2 SETS   13FAL   GCG              GC           1
02   TUBING           2 SETS   13FAM   GCH              GC           8
02   HOSE             2 SETS   13FAN   GCJ              GC           8
02  PARKING BRAKE                      GD               GC             000000000
02   CONTROL ASSY              13FAA   GDA              GD           8
02   PARKING BRAKE VALVE       13FAC   GDB              GD           A
02  PILOT ACTUATION                    GE               GC        GF   111111111
02   BRAKE  PEDAL LINK         13FAB   GEA              GE           A
02   RUDDER/BRAKE PEDAL        14CAA   GEB              GE           A
02   PEDAL SUPPORT             14CAC   GEC              GF           A
02  COPILOT ACTUATION                  GF               GC      K GE   AAAAAAAAA
02   BRAKE PEDAL LINK          13FAB   GFA              GF           A
02   RUDDER/BRAKE PEDAL        14CAA   GFB              GF           A
02   PEDAL SUPPORT             14CAC   GFC              GF           A
02  NOSE WHEEL STEERING                GG               GB        GC   111111111
02   BUNGEE                    13GAA   GGA              GG           A
02   STEERING CAM              13GAB   GGB              GG           A
02   BELL CRANK                13GAC   GGC              GG           A
02   LOCK                      13GAD   GGD              GG           0
02   ROD                       13GAE   GGE              GG           A
02   STEERING COLLAR           13CAE   GGF              GG           A
02   TORQUE LINK               13CAF   GGG              GG           A
02  RUDDER BARLINK/ROD ASSY    14CAD   GGH              GG           8
02   SHIMMY DAMPENER           13CB3   GGJ              GG           0
02  PILOT CONTROL                     LGH               GG       RGH   111111111
02  COPILOT CONTROL                   RGH               GG      KLGH   AAAAAAAAA
02    RUDDER/BRAKE PEDAL       14CAA  LGHA             LGH           A
02    RUDDER/BRAKE PEDAL       14CAA  RGHA             RGH           A
02   PEDAL SUPPORT             14CAC  LGHB             LGH           A
02   PEDAL SUPPORT             14CAC  RGHB             RGH           A
02  MISSION SUPPORT                    M                               AAAAAAAAA
02A OFFENSIVE ARMAMENT                 MA               M              020010020
02A SUSPENSION/RELEASE                 MAA              MA             111111111
02A STORES SUSPENSION                  MAB              MAA            111111111
02A  PYLON ASSY, INBD %2EA<    75ABO   MABA             MAB          1
02A  SHELL %2EA<               75ABA   MABB             MAB          0
02A  FAIRING %2EA<             75ABC   MABC             MAB          0
02A  FAIRING %2EA<             75ABD   MABD             MAB          0
02A  SWAY BRACE ASSY %2EA<     75ABE   MABE             MAB          1
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02A	RACK,BOMB%MA-4< %2EA<	75ABJ	MABF	MAB		1	
02A	PYLON ASSY OUTBD %2EA<	75ACO	MABG	MAB		1	
02A	SHELL %2EA<	75ACA	MABH	MAB		0	
02A	FAIRING %2EA<	75ACC	MABJ	MAB		0	
02A	FAIRING %2EA<	75ACD	MABK	MAB		0	
02A	SWAY BRACE ASSY %2EA<	75ACE	MABL	MAB		1	
02A	RACK BOMB %MA-4< %2EA<	75ACJ	MABM	MAB		1	
02A	GUNS		MAC	MAB			111111111
02A	MACHINE GUN POD SUU-11A	75CAO	MACA	MAC		1	
02A	MACHINEGUN ASSY	75CAA	MACB	MAC		1	
02A	SWITCH-GUN BATT CHARGE	75BAB	MACC	MAC		0	
02A	CKT BKR GUN BATT CHARGE	42FAB	MACD	MAC		0	
02A	BOMBS/ROCKETS/MISSLES		MAD	MAB			111111111
02A	DISPENSER,BOMBRACK %4EA<	75CFO	MADA	MAD		1	
02A	SWAY BRACE ASSY %4EA<	75CFA	MADB	MAD		0	
02A	SHELL ASSY %4EA<	75CFC	MADC	MAD		0	
02A	BOMB RACK %MA-4< %4EA<	75CFD	MADD	MAD		1	
02A	LAUNCHER ROCKET LAU-59	75CGO	MADE	MAD		1	
02A	LAUNCHER ROCKET LAU-58	75CHO	MADF	MAD		1	
02A	BOMB DISPENSER CBU-14	75CJO	MADG	MAD		1	
02A	SWITCH PYLON RACK	75ABG	MADH	MAD		0	
02A	SWITCH PYLON RACK	75ACG	MADJ	MAD		0	
02A	ARMAMENT CONTROL		MAE	MAA			111111111
02A	ARMING		MAF	MAE			000000000
02A	HANDLE ASSY ARMING %2EA<	75ABF	MAFA	MAF		2	
02A	SOLENOID ARMING %4EA<	75ABK	MAFB	MAF		1	
02A	LEVER COCKING %2EA<	75ABL	MAFC	MAF		2	
02A	HANDLE ASSY ARMING %2EA<	75ACF	MAFD	MAF		2	
02A	SOLENOID ARMING %4EA<	75ACK	MAFE	MAF		1	
02A	LEVER COCKING %2EA<	75ACL	MAFF	MAF		2	
02A	SALVO ARM-RELEASE RELAY	75AAB	MAFG	MAF		A	
02A	ARM SWITCH	75BAE	MAFH	MAF		A	
02A	MASTER ARMAMENT SWITCH	75BAF	MAFJ	MAF		A	
02A	CKT BKR %10A< ARMING CKTS	42FAB	MAFK	MAF		A	
02A	NORMAL RELEASE/FIRE		MAG	MAE	MAH		111111111
02A	MASTER ARMAMENT SWITCH	75BAE	MAGA	MAG		A	
02A	FIRE/DROP RELAY %2EA<	75AAA	MAGB	MAG		5	
02A	FIRE/DROP SWITCH %4EA<	75BAC	MAGC	MAG		2	
02A	CKT BKR %20A< %2EA<	42FAB	MAGD	MAG		5	
02A	TRIGGER SWITCH	75AAD	MAGE	MAG		A	
02A	PANEL ELECTROLUMINSENT	75BAH	MAGF	MAG		0	
02A	POWER SUPPLY-PANEL	75BAJ	MAGG	MAG		0	
02A	DIODE%2EA<	75AAF	MAGH	MAG		1	
02A	SOVAT SWITCH	13CCC	MAGJ	MAG		5	
02A	CKT BKR %3A< GRD DISABLE	42FAB	MAGK	MAG		A	
02A	EMERGENCY SALVO		MAH	MAE	K MAG		AAAAAAAAA
02A	SALVO-ARM RELEASE RELAY	75AAB	MAHA	MAH		A	
02A	JETTISON SWITCH	75AAC	MAHB	MAH		A	
02A	AIMING		MAJ	MA			000000000
02A	GUNSIGHT ASSY	74AAA	MAJA	MAJ		8	

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02A	RHEOSTAT	74AAD	MAJB	MAJ	8
02A	CKT BKR GUNSIGHT	42FAB	MAJC	MAJ	A
02A	PHOTO/RECON		MB	M	000000000
02A	CAMERA ASSY KB-18	77AAA	MBA	MB	8
02A	CONTROL	77AAE	MBB	MB	8
02A	CKT BKR CAMERA %3A<	42FAB	MBC	MB	A
02A	SMOKE GENERATION		MC	M	000000000
02A	TANK ASSY	95AAA	MCA	MC	1
02A	PUMP-FUEL	95AAD	MCB	MC	A
02A	VALVE-SOLENOID	95AAE	MCC	MC	A
02A	SWITCH OFF-ON	9995A	MCD	MC	A
02A	CKT BKR-SMOKE PUMP%3A<	42FAB	MCE	MC	A
02B	PSYCHOLOGICAL WARFARE		MD	M	000000000
02B	LOUDSPEAKER	69BA1	MDA	MD	8
02B	DRIVE UNIT	69EAA	MDB	MD	8
02B	AMPLIFIER %3EA<	69BE1	MDC	MD	5
02B	CONTROL UNIT	69BF1	MDD	MD	8
02B	DISTRIBUTION PANEL	69BG1	MDE	MD	8
02B	RECORDER UNIT	69BH1	MDF	MD	5
02B	CKT BKR	42FCD	MDG	MD	A
02B	ELECT DISABLE CONTACTOR	9942C	MDH	MD	A
02	LANDING GEAR		N		AAAAAAAAA
02	EXTEND GEAR		NA	N	0000000A0
02	ROLLING SUPPORT		NB	N	1800000A1
02	AXLE MAIN GEAR	13BAC	NBA	NB	A
02	AXLE TUBE NOSE GEAR	13CAH	NBB	NB	A
02	WHEEL 2EA MAIN	13EAA	NBC	NB	2
02	BEARING 2EA MAIN	13EAB	NBD	NB	6
02	TIRE 2 EA MAIN	13EAC	NBE	NB	1
02	TUBE 2 EA MAIN	13EAD	NBF	NB	1
02	WHEEL NOSE	13EBA	NBG	NB	2
02	BEARING NOSE	13EBB	NBH	NB	1
02	TIRE NOSE	13EBC	NBJ	NB	1
02	TUBE NOSE	13EBD	NBK	NB	1
02	SPRING STRUT 2EA MAIN	13BAB	NBL	NB	A
02	SHOCK STRUT NOSE	13CAA	NBM	NB	A
02	TRUNNION NOSE	13CAB	NBN	NB	0
02	CYLINDER-SHOCK STRUT NOSE	13CAC	NBP	NB	1
02	PISTON-SHOCK STRUT NOSE	13CAD	NBQ	NB	0
02	FORK NOSE	13CAK	NBR	NB	A
02	PRESSURE DISTRIBUTION		NC	NA	AAAAAAAAA
02	PRESSURE DISTRIBUTION		NC	ND	AAAAAAAAA
02	POWER PACK	13ABA	NCA	NC	8
02	MANIFOLD	13ABB	NCB	NC	A
02	LOCKOUT SOLENOID	13ACA	NCC	NC	1
02	ACTUATOR MAIN GEAR	13BBA	NCD	NC	8
02	ACTUATOR NOSE GEAR	13CBA	NCE	NC	8
02	HOSE LH MN GR WHL DR CLOSE	13BBF	NCF	NC	1
02	HOSE LH MN GR WHL DR OPEN	13BBG	NCG	NC	1
02	HOSE RH MN GR WHL DR CLOSE	13BBH	NCH	NC	1

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02   HOSE RH MN GR WHL DR OPEN 13BBJ   NCJ              NC           1
02   HOSE NOSE GR DR ACT OPEN  13CBK   NCK              NC           1
02   HOSE NOSE GR DR ACT CLOSE 13CBL   NCL              NC           1
02   ACTUATOR-MN GR DOORS      13DCA   NCM              NC           8
02   ACTUATOR-NOSE GR DOORS    13DCB   NCN              NC           8
02   ACTUATOR-MN GEAR STRUT OP 13DCC   NCP              NC           8
02  RETRACT GEAR                       ND               N              000000000
02  MAIN GEAR AND DOORS DOWN           NE               NA             AAAAAAAAA
02   SADDLE 2EA                13BAA   NEA              NE           0
02   DOWNLOCK 2EA              13BAD   NEC              NE           A
02   DOWNLOCK ADJ SUPPORT 2EA  13BAF   NED              NE           8
02   UPLOCK HOOK 2EA           13BAJ   NEE              NE           1
02   U JOINT ASSY 2EA          13BAL   NEF              NE           1
02   LINKAGE  2EA              13BAM   NEG              NE           1
02   DOOR ASSY 2EA             13DAA   NEH              NE           0
02   DOOR ASSY STRT 2EA        13DAB   NEJ              NE           0
02  NOSE GEAR AND DOORS DOWN           NF               NA             AAAAAAAAA
02   UPLOCK HOOK               13CAG   NFA              NF           1
02   DOWNLOCK HOOK             13CAJ   NFB              NF           1
02   COLLAR LOCKING AND SPRING 13CAL   NFC              NF           0
02   WHEEL STOP BUMPER         11ACA   NFD              NF           0
02   DOOR ASSY                 13DAF   NFE              NF           0
02   CIRCUIT BREAKER           42FAB   NFF              NF           0
02   SQUAT SWITCH              13CCC   NFG              NF           0
02  EXTEND ACTUATION                   NG               NA             AAAAAAAAA
02  EXTEND ACTUATION                   NG               NU            FAAAAAAAAA
02   LDG CONTROL               13AAA   NGA              NG           A
02   LINKAGE                   13AAB   NGB              NG           8
02   HANDLE UP-DOWN SWITCH     13ACB   NGC              NG           A
02   ACTUATOR DWNLOCK MN GEAR  13BBB   NGD              NG           8
02   ACTUATOR UPLOCK RELEASE   13BBC   NGE              NG           8
02   HOSE MN STRUT DOOR OPEN   13BBE   NGF              NG           1
02   HOSE LH MN GR DWNLOCK LOCK13BBM   NGG              NG           1
02   HOSE RH MN GR DWNLOCK LOCK13BBQ   NGH              NG           1
02   ACTUATOR UPLOCK REL NOSE  13CBC   NGJ              NG           8
02   HOSE NOSE STRUT ACT EXTEND13CBN   NGK              NG           1
02  NORMAL PRESSURE                    NJ               NC       NK    111111111
02   HYDRAULIC PUMP            13ABC   NJA              NJ           A
02  EMERGENCY PRESSURE                 NK               NC     K NJ    AAAAAAAAA
02   HAND PUMP EMERGENCY       13ABE   NKA              NK           A
02   LEVER-EMERGENCY HAND PUMP 13ABF   NKB              NK           A
02  RETRACT ACTUATE                    NL               ND             AAAAAAAAA
02  RETRACT ACTUATE                    NL               NU            F111111111
02   LDG CONTROL               13AAA   NLA              NL           A
02   LINKAGE                   13AAB   NLB              NL           8
02   HANDLE UP-DOWN SWITCH     13ACB   NLC              NL           A
02   HOSE LH MN GR DWNLOCK UNLK13BBK   NLD              NL           1
02   HOSE LH MN GR DWNLOCK UNLK13BBL   NLE              NL           1
02   HOSE RH MN GR DWNLOCK UNLK13BBN   NLF              NL           1
02   HOSE RH MN GR DWNLOCK UNLK13BBP   NLG              NL           1
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02   HOSE NOSE STRUT ACT RETRAC13CBM   NLH              NL           1
02  NOSE GEAR AND DOORS UP             NM               ND             AAAAAAAAA
02   UPLOCK HOOK              13CAG    NMA              NM           1
02   DOWNLOCK HOOK            13CAJ    NMB              NM           1
02   COLLAR LOCKING AND SPRING 13CAL   NMC              NM           A
02   WHEEL STOP BUMPER        11ACA    NMD              NM           0
02   DOOR ASSY                13DAF    NME              NM           0
02   CIRCUIT BREAKER          42FAB    NMF              NM           A
02   SQUAT SWITCH             13CCC    NMG              NM           0
02  MAIN GEAR AND DOORS UP             NN               ND             AAAAAAAAA
02   SADDLE                   13BAA    NNA              NN           0
02   DOWNLOCK HOOK            13BAD    NNB              NN           1
02   DOWNLOCK ADJ SUPPORT     13BAF    NNC              NN           8
02   UPLOCK HOOK              13BAJ    NND              NN           1
02   U JOINT ASSY 2EA         13BAL    NNE              NN           A
02   LINKAGE 2EA              13BAM    NNF              NN           1
02   DOOR ASSY 2EA            13DAA    NNG              NN           0
02   DOOR ASSY STRUT 2EA      13DAB    NNH              NN           0
02   HOSE MAIN STRUT DR CLOSED 13BBD   NNJ              NN           1
02  LDG UNSAFE INDICATION              NU               NA      I NG   111111111
02   SWITCH WNG HORN DISABLE  13ACE    NUA              NU           1
02   SWITCH GEAR WNG THROTTLE 13ACF    NUB              NU           1
02   GEAR TRANSIT AND UP LIGHT 13ACG   NUC              NU           1
02   GEAR DOWN LIGHT          13ACH    NUD              NU           1
02   RELAY GD DISABLE WNG HORN 13ACJ   NUE              NU           1
02   SWITCH-UPLOCK MAIN GEAR  13BCA    NUG              NU           1
02   SWITCH-DOWNLOCK MAIN GEAR 13BCB   NUH              NU           1
02   SWITCH UPLOCK            13CCA    NUJ              NU           1
02   SWITCH-DOWNLOCK NOSE GEAR 13CCB   NUK              NU           1
02   CIRCUIT BREAKER 2EA      42FAB    NUL              NU           1
02   WARNING RELAY %GD DISABLE<13ACD   NUM              NU           0
02  60VA AC DIST                       UAA              CCD            AAAAAAAAA
02  60VA AC DIST                       UAA              CCF           FAAAAAAAAA
02  60VA AC DIST                       UAA              CCH           FAAAAAAAAA
02  50VA AC DIST                       UAA              CCJ           FAAAAAAAAA
02  60VA AC DIST                       UAA              CCP            AAAAAAAAA
02A 60VA AC DIST                       UAA              CCQ           SAAAAAAAAA
02A 60VA AC DIST                       UAA              CCR           FAAAAAAAAA
02A 60 VA AC DIST                      UAA              CCT           FAAAAAAAAA
02B 60 VA AC DIST                      UAA              CCT            AAAAAAAAA
02A 60VA AC DIST                       UAA              DQ             AAAAAAAAA
02A  SELECTOR SWITCH INVERTER 9942A    UAAA             UAA          5
02B  INVERTER                 42FAG    UAAB             UAA          A
02B  CKT BKR GYRO POWER       42FAB    UAAC             UAA          A
02A 60 VA AC  SVS  NO 1                UAB              UAA     K UAC  AAAAAAAAA
02A  INVERTER                 42FAG    UABA             UAB          A
02A  CKT BKR INV PWR NO 1     42FAB    UABB             UAB          A
02A 60 VA AC SVS NO2                   UAC              UAA     K UAB  AAAAAAAAA
02A  INVERTER                 42FAG    UACA             UAC          A
02A  CKT BKR INV PWR NO 2     42FAB    UACB             UAC          A
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02   400 VA AC DIST                          UAD                CBA          AAAAAAAAA
02   400 VA AC DIST                          UAD                CCD          AAAAAAAAA
02     CKT BKR                     42FCD     UADA               UAD          A
02     INVERTER            42FAJ   42FAH     UADB               UAD          A
02     INVERTER            42FAH   42FAJ     UADC               UAD          A
02A    RELAY INVERTER              42FCH     UADD               UAD          8
02   PRIMARY DC BUS                          UDA                LBHX        FAAAAAAAAA
02   PRIMARY DC BUS                          UDA                RBHX        FAAAAAAAAA
02   PRIMARY DC BUS                          UDA                LBJX         AAAAAAAAA
02   PRIMARY DC BUS                          UDA                RBJX         AAAAAAAAA
02   PRIMARY DC BUS                          UDA                LBKA         AAAAAAAAA
02   PRIMARY DC BUS                          UDA                RBKA         AAAAAAAAA
02   PRIMARY DC BUS                          UDA                LBN          AAAAAAAAA
02   PRIMARY DC BUS                          UDA                RBN          AAAAAAAAA
02   PRIMARY DC BUS                          UDA                LBRF         AAAAAAAAA
02   PRIMARY DC BUS                          UDA                RBRF         AAAAAAAAA
02   PRIMARY DC BUS                          UDA                LBSC         AAAAAAAAA
02   PRIMARY DC BUS                          UDA                RBSC         AAAAAAAAA
02   PRIMARY DC BUS                          UDA                CAL          AAAAAAAAA
02   PRIMARY DC BUS                          UDA                DL           AAAAAAAAA
02   PRIMARY DC BUS                          UDA                DP           AAAAAAAAA
02   PRIMARY DC BUS                          UDA                DU           AAAAAAAAA
02   PRIMARY DC BUS                          UDA                DV          FAAAAAAAAA
02   PRIMARY DC BUS                          UDA                EA           AAAAAAAAA
02   PRIMARY DC BUS                          UDA                FAF          AAAAAAAAA
02A  PRIMARY DC BUS                          UDA                FCG          AAAAAAAAA
02A  PRIMARY DC BUS                          UDA                MAG          AAAAAAAAA
02A  PRIMARY DC BUS                          UDA                MAJ          AAAAAAAAA
02A  PRIMARY DC BUS                          UDA                MB           AAAAAAAAA
02A  PRIMARY DC BUS                          UDA                MC           AAAAAAAAA
02   PRIMARY DC BUS                          UDA                NF           000000000
02   PRIMARY DC BUS                          UDA                NL           AAAAAAAAA
02   PRIMARY DC POWER                        UDA                NU           AAAAAAAAA
02A  PRIMARY DC BUS                          UDA                UAA         SAAAAAAAAA
02B  PRIMARY DC BUS                          UDA                UAA          AAAAAAAAA
02A  PRIMARY DC BUS                          UDA                UAB         FAAAAAAAAA
02A  PRIMARY DC BUS                          UDA                UAC         FAAAAAAAAA
02   PRIMARY DC BUS                          UDA                UDH         FAAAAAAAAA
02     JUNCTION BOX FWD            42FBO     UDAA               UDA          1
02     TERMINAL STRIP              42FBB     UDAB               UDA          0
02     CKT BKR PANEL               42FAF     UDAC               UDA          0
02     RELAY                       42FAD     UDAD               UDA          0
02     JUNCTION BOX REAR           42FCO     UDAE               UDA          1
02     TERMINAL STRIP              42FCE     UDAF               UDA          0
02     FILTER                      42FCB     UDAG               UDA          0
02B    VOLTMETER                   42GAA     UDAH               UDA          C
02   DC ELECTRONICS DIST                     UDB                CAB         SAAAAAAAAA
02   DC ELECTRONICS DIST                     UDB                CAD          AAAAAAAAA
02   DC ELECTRONICS DIST                     UDB                CAE         FAAAAAAAAA
02   DC ELECTRONICS DIST                     UDB                CAF         FAAAAAAAAA
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02	DC ELECTRONICS DIST		UDB	CAG		FAAAAAAAAA
02	DC ELECTRONICS DIST		UDB	CB		SAAAAAAAAA
02	DC ELECTRONICS DIST		UDB	CBA		FAAAAAAAAA
02A	DC ELECTRONICS DIST		UDB	CBB		FAAAAAAAAA
02	DC ELECTRONICS DIST		UDB	CCB		S777777777
02	DC ELECTRONICS DIST		UDB	CCD		FAAAAAAAAA
02	DC ELECTRONICS DIST		UDB	CCM		FAAAAAAAAA
02B	DC ELECTRONICS DIST		UDB	MD		AAAAAAAAA
02	DC ELECTRONICS BUS		UDB	UAD		AAAAAAAAA
02	JUNCTION BOX REAR	42FCO	UDBA	UDB		1
02	TERMINAL STRIP	42FCE	UDBB	UDB		0
02	FILTER	42FCB	UDBC	UDB		0
02B	ELECT DISABLE CONTACTOR	9942C	UDBD	UDB		1
02	NORMAL SOURCE		UDC	UDA	UDE	111111111
02	NORMAL SOURCE		UDC	UDK		AAAAAAAAA
02	FRONT ALT SUPPLY		LUDD	UDC	KRUDD	AAAAAAAAA
02	REAR ALT SUPPLY		RUDD	UDC	KLUDD	AAAAAAAAA
02	GEAR DRIVEN ALT	42AAA	LUDDA	LUDD		A
02	GEAR DRIVEN ALT	42AAA	RUDDA	RUDD		A
02	DRIVE	42AAB	LUDDB	LUDD		A
02	DRIVE	42AAB	RUDDB	RUDD		A
02A	ALT ASSY BELT DRIVEN	42AAE	RUDDC	RUDD		A
02A	ARM ALT ADJUST	42AAF	RUDDD	RUDD		1
02A	BELT ALT DRIVE	42AAG	RUDDE	RUDD		A
02A	SUPPORT ASSY	42AAH	RUDDF	RUDD		1
02A	SHOCK MOUNT .	42AAJ	RUDDG	RUDD		0
02A	PULLEY PROP SHAFT	42AAK	RUDDH	RUDD		A
02	ALTERNATOR SWITCH	42CAA	LUDDJ	LUDD		A
02	ALTERNATOR SWITCH	42CAA	RUDDJ	RUDD		A
02	CKT BKR	42FAB	LUDDK	LUDD		A
02	CKT BKR	42FAB	RUDDK	RUDD		A
02	ALT SHUNT	42FAC	LUDDL	LUDD		A
02	ALT SHUNT	42FAC	RUDDL	RUDD		A
02	SUPPRESSOR	42CAF	LUDDM	LUDD		8
02	SUPPRESSOR	42CAF	RUDDM	RUDD		8
02	EMERGENCY SOURCE		UDE	UDA	K UDC	AAAAAAAAA
02	BATTERY SHUNT	42FAC	UDEA	UDE		A
02	BATTERY SHUNT	42FAC	UDEA	UDK		A
02B	CONTROL/REGULATION		UDF	UDC		AAAAAAAAA
02A	CONTROL/REGULATION		LUDF	LUDD		AAAAAAAAA
02A	CONTROL/REGULATION		RUDF	RUDD		AAAAAAAAA
02B	VOLTAGE REGULATOR %2EA<	42CAC	UDFA	UDF		1
02A	VOLTAGE REGULATOR	42CAC	LUDFA	LUDF		8
02A	VOLTAGE REGULATOR	42CAC	RUDFA	RUDF		8
02B	AMMETER	42GAB	UDFB	UDF		0
02A	AMMETER	42GAB	LUDFB	LUDF		0
02A	AMMETER	42GAB	RUDFB	RUDF		0
02B	SWITCH REG SELECT	42CAD	UDFC	UDF		8
02A	FIELD CURRENT SOURCE		UDG	UDC		SAAAAAAAAA
02A	FIELD CURRENT SOURCE		UDG	LUDD		FAAAAAAAAA

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02A  FIELD CURRENT SOURCE              UDG             RUDD           FAAAAAAAAA
02B  FIELD CURRENT SOURCE              UDG              UDF            AAAAAAAAA
02    OVERVOLTAGE RELAY        42GAG   UDGA             UDG          8
02B   ALT RUN/STBY SW          42CAE   UDGB             UDG          A
02   NORMAL  SOURCE                    UDH              UDG      UDJ   111111111
02    ALT FIELD CKT BKR        42FAB   UDHA             UDH          A
02    BATT/MASTER SW           42EAE   UDHB             UDH          A
02   EMERGENCY SOURCE                  UDJ              UDG    K UDH   AAAAAAAAA
02A   RESTART SWITCH           42CAB   UDJA             UDJ          A
02A   RECT DIODES              42EAF   UDJB             UDJ          5
02B   DIODE                    42EAF   UDJC             UDJ          A
02B   FUSE                     9942B   UDJD             UDJ          A
02   BUS-TO-BUS CONNECTION             UDK              UDB      UDL   111111111
02  BATTERY CONNECTION                 UDL              UDB    K UDK   AAAAAAAAA
02  BATTERY CONNECTION                 UDL              UDE            AAAAAAAAA
02   BATTERY CONTACTOR         42EAD   UDLA             UDL          A
02   DIODE                     42EAF   UDLB             UDL          5
02   BATT/MASTER SWITCH        42EAE   UDLC             UDL          A
02A BATTERY SUPPLY                     UDM              MAH            AAAAAAAAA
02B BATTERY SUPPLY                     UDM              UDJ           FAAAAAAAAA
02  BATTERY SUPPLY                     UDM              UDL            AAAAAAAAA
02   BATT,LEAD ACID            42EAA   UDMA             UDM          6
02A  BATT  NICAD               42EAH   UDMB             UDM          6
02   BATT  BOX                 42EAC   UDMC             UDM          0
02  EXTERNAL POWER                     UDN              UDB            000000000
02  EXTERNAL POWER                     UDN              UDE            000000000
02   RECEPTACLE                42FAA   UDNA             UDN          8
02A  CONTACTOR                 42FAK   UDNB             UDN          A
02A  DIODE                     9942F   UDNC             UDN          A
02A  RESISTOR,EXT POWER        9942E   UDND             UDN          A
02A  FUSE  EXT  POWER          9942D   UDNE             UDN          A
```

CARD COUNT IS 00001380. CARDS WITH ERRORS 00000000